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WATER QUALITY BRANCH ACTIVITIES IN NEWFOUNDLAND 1965-1985

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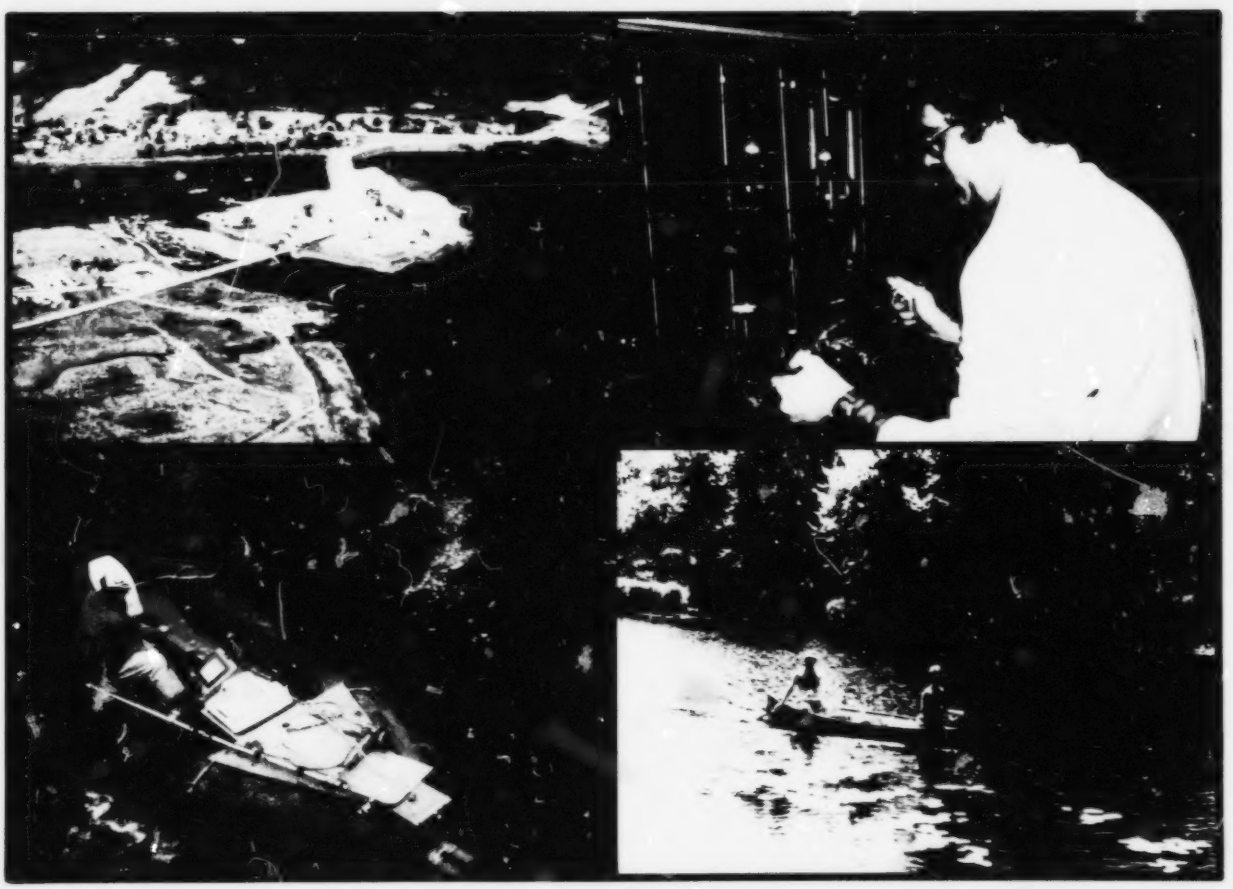

Canada

INLAND WATERS DIRECTORATE
ATLANTIC REGION
WATER QUALITY BRANCH
MONCTON, NEW BRUNSWICK

WATER QUALITY BRANCH ACTIVITIES

IN NEWFOUNDLAND

1965-1985

IW/L-AR-WQB-86-107

INLAND WATERS/LANDS DIRECTORATE
CONSERVATION AND PROTECTION
ENVIRONMENT CANADA

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April 1, 1987

A copy will be made available in French upon request

CONTENTS

	PAGE
ABSTRACT/RÉSUMÉ	iii
AUTHORS' NOTE	v
ACKNOWLEDGEMENTS	vi
INTRODUCTION	1
HISTORICAL OVERVIEW	3
a) Industrial Waters Section	3
b) Water Quality Division	4
c) Water Quality Branch	5
ACTIVITIES	6
DATA AND REPORTS	12
OUTLOOK FOR THE FUTURE	14
TABLE 1 - WQB Projects	16
TABLE 2 - WQB Supported Projects	17
TABLE 3 - Station Listing	18
APPENDIX I - Federal Legislative Acts Related to Water	25
APPENDIX II - I.H.D. National Water Quality Monitoring	26
APPENDIX III - I.H.D. Research Basin Study	29
APPENDIX IV - WQB National Water Quality Monitoring	30
APPENDIX V - Atlantic Region Overview Network	32
APPENDIX VI - Labrador Water Quality Survey	34
APPENDIX VII - Acid Rain Sensitivity Mapping	35
APPENDIX VIII- Pollutant Specific Survey	36

APPENDIX IX - Labrador-Quebec Interprovincial Waters 39
APPENDIX X - Waterford River Basin Urban Hydrology Study . 42
APPENDIX XI - LRTAP Lakes Monitoring 44
APPENDIX XII - Toxic Chemical Survey 47
APPENDIX XIII- Municipal Water Toxic Chemical Survey 49

MAP #1 - I.H.D. National Water Quality Monitoring 54
MAP #2 - I.H.D. Research Basin Study 55
MAP #3 - WQB National Water Quality Monitoring 56
MAP #4 - Atlantic Region LRTAP/Overview Network 57
MAP #5 - Labrador Water Quality Survey 58
MAP #6 - Pollutant Specific Surveys 59
MAP #7 - Labrador-Quebec Interprovincial Waters 60
MAP #8 - Waterford River Basin Urban Hydrology Study 62
MAP #9 - LRTAP Lakes Monitoring 63
MAP #10 - Toxic Chemical Survey 64
MAP #11 - Municipal Water Toxic Chemical Survey 65

ABSTRACT

This report gives a brief chronological overview of Water Quality Branch activities in the Province of Newfoundland. It was not designed to be an exhaustive treatise but only to present highlights of the work accomplished over the 1965-1985 period.

This document summarizes the background of the Water Quality Branch programs, projects and studies, explaining when and why they were initiated, how they were conducted and what type of data were generated. It elucidates how the Water Quality Branch evolved over the years in response to new policies and changing institutional needs. It was written with the expectation that reflection on past activities would germinate the seeds for future joint Federal/Provincial scientific endeavors.

RÉSUMÉ

Le présent rapport donne un bref aperçu chronologique des activités de la Direction de la qualité des eaux dans la province de Terre-Neuve. Cet ouvrage ne constitue pas une analyse détaillée des activités, mais il vise plutôt à signaler les faits saillants des travaux accomplis pendant la période 1965-1985.

Le document expose l'origine des programmes, projets et études de la Direction de la qualité des eaux; il précise également le démarrage et le pourquoi des travaux, la façon dont ils ont été menés, ainsi que le genre de données qui en sont découlées. De plus, il explique comment la Direction de la qualité des eaux s'est adaptée au cours des années aux nouvelles politiques et aux besoins variés des établissements. Il a été rédigé dans l'espoir que la rétrospective d'activités passées favorise la conclusion de futures ententes scientifiques profitables entre le gouvernement fédéral et la province.

AUTHORS' NOTE

It should be noted that this report is an update of an original document prepared by P.E. Belliveau and V.A. Komadina in 1982 entitled, "Water Quality Branch Activities in Newfoundland: 1965-1980". The decisions to update the document was based on two factors; the first being the frequent demand for the original report which is now out of print and the second being the number of changes the Water Quality Branch has undergone over the past five years as it endeavored to respond to new and changing requirements. It is hoped that this updated version will prove even more worthwhile than the first edition.

ACKNOWLEDGEMENTS

The authors wish to express their gratitude to Hal Bailey for providing useful information on the project and studies described in this report and for his assistance in the preparation of maps. Louise Boulter and Francine Melanson's assistance in typing and proofreading the manuscript is also appreciated.

INTRODUCTION

The Water Quality Branch, Inland Waters Directorate, Atlantic Region, conducts water quality surveys and studies designed specifically to provide ambient water quality data and interpretive information to water resource managers and pollution control agencies. Its present role is to:

1. Provide scientific and technical information and advice to government, private agencies and the public, and to promote the wise management of the quality of waters;

    (a) shared by Canada and the United States, and by one or more provinces and/or territories;

    (b) on federal lands such as national parks, Indian reserves and heritage canals, and other properties and facilities where water resource management is primarily a federal responsibility;

    (c) where there is federal responsibility such as for fisheries and wildlife.

2. Detect emerging water quality problems and to evaluate water quality issues on Canada's inland waters from a regional and national point of view.

The Branch's mandate to participate in these activities is derived from the various Federal Legislative Acts listed in Appendix I and from the Federal Policy Statement on Inland Waters (1978). The Water Quality Branch has no regulatory or enforcement functions and its activities are limited to the inland aquatic environment.

The Water Quality Branch's principal areas of interest are:

- international and interprovincial waters;
- waters located in the territories, on federal lands or waters of significant national interests;
- waters affected by long-range transport of airborne pollutants (LRTAP);
- waters affected by toxic chemicals;
- freshwater used as supplies for human consumption;
- water quality conservation; and
- Canadian Water Quality Guidelines.

The Branch also negotiates and implements Federal-Provincial Water Quality Monitoring Agreements and provides advice, leadership

and expertise in the development of Water Quality Objectives.

The data generated are used in the identification of emerging environmental problems and water quality trends, the production of data and interpretive reports,and as a data bank for water resource managers. All data collected are stored on the Water Quality Branch's National Water Quality Data Bank (NAQUADAT) and are available to users at minimal charge.

HISTORICAL OVERVIEW

a) Industrial Waters Section

In the early 1930's, the Federal Government, recognizing the emerging significance of water quality in Canada, created the Industrial Waters Section within the Mines and Geological Branch of the Department of Mines and Technical Surveys. This action was in response to requests from Canadian Manufacturers, especially those of pulp and paper, and of soap, to study the natural and treated waters of Canada. Although this Section's work was curtailed during WW II it resumed in 1946 and continued with little modification until the early 1960's.

During the 1950's and early 1960's, the Industrial Waters Section's emphasis shifted slightly to the collection of aquatic chemical data having geological significance, from major bodies of

water across Canada, and the reporting of these data in a technical bulletin series entitled "Industrial Waters of Canada". In order to accomplish this task, Canada was divided into eighteen large drainage basins and water quality surveys were carried out at a rate of one or two basins per year. Aside from these surveys, the Section also provided operational and advisory services to other departments on corrosion control, boiler feed-water treatment, and treatment of water supplies for non-potable use.

b) Water Quality Division

In the mid-1960's, because of its expertise in analyzing water samples and in assessing water quality, this unit was the logical choice for expanding the role of the federal government in the field of water quality. Upon Departmental reorganization, the expanded Industrial Waters Section became the Water Quality Division within the Inland Waters Branch of the Department of Energy, Mines and Resources. The responsibilities of this new Division were to collect, interpret and disseminate data on the quality of freshwater in Canada, with the expressed purpose of identifying areas of pollution, establishing baselines of quality and monitoring these waters so that they would be properly used, managed and developed. With the establishment of a regional laboratory in Halifax (1964), which was later moved to Moncton (1966), the Water Quality Division also initiated the provision of laboratory support to provincial agencies requiring water analysis. The original aim was to provide this service to the provinces only

until they could develop their own laboratory capabilities. This action resulted in dividing Water Quality Division activities into two main categories: those conducted as part of the operational programs (Table 1) and those which were carried out in support of other agencies (Table 2). This report focusses only on the former type of activities.

c) Water Quality Branch

In 1971, as a result of the Department of the Environment Act (1970), the Water Quality Division was transferred to the new Department of the Environment and became the Water Quality Branch of the Inland Waters Directorate. Its assigned responsibilities were focussed on environmental concerns. In essence, its new role was to provide ambient water quality data and interpretive information to water resource managers and pollution control agencies. This information was to be employed for environmental assessment studies, pollution control legislation, assessment of the suitability of water for domestic and industrial uses, research and for input to federal/provincial and international agreements and commitments.

ACTIVITIES

The Water Quality Branch's first major monitoring effort was the International Hydrological Decade (I.H.D.) National Water Quality Monitoring Program (1965-1974). The overall aim of this UNESCO program, in the field of hydrology, was described as:

> "to accelerate the study of water resources and the regiment of waters with a view of their rationale management in the interest of mankind; to make known the need for hydrological research and education in all countries; and to improve their ability to evaluate their resources and use them to the best advantage".

In Canada, the Water Quality Branch's aim was to establish and maintain a national water quality and pollution evaluation network and to obtain a nationwide baseline inventory of surface water quality. In Newfoundland, the program consisted of monthly sampling by lay collectors at twenty-four water quality stations for a broad range of parameters. As such, the program provided useful estimates of water quality conditions at selected sites and proved helpful for long range planning. A short description of this project is given in Appendix II.

Concurrently, as an adjunct to this project, the I.H.D. Research Basin Study was also implemented. This was a multi-agency study which was designed to provide hydrological data from a

"representative watersheds". Measurements were to be performed on all parameters in the hydrological cycle, so that statistical and/or physical models could be developed for major climatic and geological areas. Principles derived from these models were to be used to synthesize the hydrological characteristics of ungauged areas. One of these research basins was situated in Newfoundland at Northeast Pond (Appendix III).

When the I.H.D. National Monitoring Program terminated in 1974, the Water Quality Branch reassessed the need to continue this type of program. The emphasis of the I.H.D. Program had been on maintaining a resource inventory but the mandate of the Water Quality Branch had been expanded when it became part of the Department of Environment. There was now a responsibility to examine water quality in relation to a wider range of water uses. Accordingly, in April 1974, this program was replaced by the WQB National Water Quality Monitoring Program (Appendix IV). In Newfoundland this new program consisted of monthly sampling by lay collectors at twenty-three water quality stations. It was in essence a continuation of the former program with an enhancement in the number of parameters analyzed.

A review of Departmental activities in 1977-78 coincided with the development of new federal policies concerning inland waters. A number of these policies had significant impact on Branch monitoring programs. New federal priorities required the Branch to redefine its existing programs and to concentrate on boundary water

issues. Furthermore, guidance was given as to the types of issues which should be addressed. These included identification of pollution problems, trend assessment, surveillance for water quality objectives and the assessment of the effectiveness of regulatory measures. The demand was no longer for data only but for interpretation of these data. As a result, the WQB National Water Quality Monitoring Program was terminated since it did not address the new priorities. In light of the emphasis being placed on data interpretation, it was realized that the requirement for on-site field measurements and specialized sampling procedures necessitated the replacement of lay collectors with qualified field staff.

In order to retain continuity of data for the reporting of regional overviews on water quality in the Atlantic Provinces, a limited water quality network was established in April 1978. This new program called the Atlantic Region Overview Network (Appendix V), consisting of eight stations in Newfoundland, was designed to maintain a regional inventory of baseline information for:

(1) the periodic assessment of the quality of the Atlantic Region's aquatic environment;

(2) the determination of gross trends in the aquatic environment; and

(3) the fulfillment of the Water Quality Branch commitment to provide International Agencies with ocean input data.

Water samples were collected on a bimonthly basis by trained Water Resources Branch field technicians and shipped to the Moncton Laboratory for analysis of physical parameters, major ions and trace metals.

In September 1978, the Water Quality Branch conducted its first field survey of Labrador (Appendix VI). Prior to this date, samples from Labrador had been collected by non-Branch personnel. This mini-survey was implemented in order to collect baseline water quality data from two major interprovincial bodies of water and from waters situated in areas of potential energy development. The Study also served as a reconnaissance survey to prepare the Branch for future work in the area.

With increased emphasis on acid rain and limited water quality data from inland areas of Newfoundland, the Water Quality Branch contacted a number of other agencies, in the fall of 1979, in an effort to obtain additional data. The purpose of the exercise was to prepare acid rain sensitivity maps based on the Calcite Saturation Indices of surface waters. In response, the Department of Fisheries and Oceans supplied the Water Quality Branch with data from six hundred stations sampled in Newfoundland and Labrador between 1976 and 1978 (Appendix VII). The data were stored, analyzed and interpreted by the Water Quality Branch and

appropriate maps were prepared and published.

In August 1980, the Water Quality Branch implemented the first of a series of pollutant specific surveys (Appendix VIII). The aim of these surveys was to screen for specific environmental contaminants (toxic substances) covering as broad a geographical area as possible and concentrating on perceived critical areas or in areas of federal interest. In Newfoundland, these pollutant specific surveys were conducted annually until 1982. It should be noted however, that the parameters screened varied from year to year. By the completion of this project, the following parameters had been screened: pentachlorophenols, chlorobenzenes, phthalate esters, polyaromatic hydrocarbons, mirex, carbofuran, PCB's, fenitrothion, lead, arsenic, mercury and cadmium.

From 1980 to 1984, Labrador-Quebec interprovincial water quality surveys (Appendix IX) were conducted by the Water Quality Branch. Five interprovincial basins were surveyed during that period. Water samples were collected for the analyses of major ions, physical parameters, nutrients and selected metals, while bottom sediment and fish samples were collected for the analyses of organochlorinated pesticides, polychlorinated biphenyls and heavy metals.

In 1980, the Waterford River Basin Urban Hydrology Study (Appendix X) was also initiated by a multi-agency group. The Water Quality Branch was responsible for most of the surface water sample

analyses, data interpretation and preparation of a technical report. The aim was to evaluate the quality of surface water in the this Basin and in this regards, eight surface water sites from various areas (developed and undeveloped) in this basin were studied. Most of the work associated with this project was terminated by March 1985.

To detect trends in parameters affected by acid precipitation in Newfoundland lakes, the Water Quality Branch launched its LRTAP Lakes Monitoring project, in 1983 (Appendix XI). The objective of this project was the detection and determination of water quality trends, attributable to acid precipitation, in Newfoundland lakes. The selected lakes were sampled twice a year (spring and fall) by helicopter.

As a follow up to the Pollutant Specific Surveys completed in 1982, a Toxic Chemical Survey (Appendix XII) was conducted in the Exploits River Basin, in the summer of 1984. This study involved the collection and analysis of water, bottom sediments and fish for metals and general water chemistry parameters.

Finally, in May 1985, a Municipal Water Toxic Chemical Survey was implemented jointly with the Newfoundland Departments of Health and Environment (Appendix XIII). The objectives of this project were to screen for specified environmental contaminants in raw domestic water sources in the province and to collect general water quality data. Sampling is done twice a year (spring and fall) and

the samples are analyzed for a large number of parameters.

All of these projects are described in detail in the appended material. Each Appendix outlines the project title, submitter I.D., period of record, objective(s), field sampling staff, parameters analyzed, NAQUADAT station numbers, station description and the approximate number of samples analyzed at each station. Corresponding station reference numbers are also given. Maps have been appended to facilitate the location of sampling sites. A complete station listing, describing the exact location of each station is presented in Table 3.

DATA AND REPORTS

Traditionally water quality data were handled by manual means, however, as the quantity of data increased, the Water Quality Branch was soon overwhelmed by manual filing and sorting methods. The need for flexibility and speed in retrieving data (in a variety of formats) also became important as the Branch started focussing on data interpretation. This led to the introduction of a computerized data handling system called NAQUADAT (National Water Quality Data Bank). NAQUADAT provides a flexible system for storing the results of environmental analyses and other pertinent information related to the sample and the sampling station, and for producing a large variety of retrieval reports, statistical

analyses and graphical presentations. In general, all of the data from the projects listed in Table 1 and 2 are stored on NAQUADAT. These data are available from the Water Quality Branch Head Office in Ottawa and most are also available regionally from the Moncton Office.

Recently, the Water Quality Branch in Moncton, reacting to technological advances and responding to regional requirements for storage, management and interpretation of water quality data, acquired a VAX 11/750 computer and equipped it with the RS-1 statistical software package. This VAX 11/750 computer is also used to run the LABS-11 laboratory data management system and various other programs. Branch staff have recently developed the NABIODAT data management system. This system will be used for the storage and processing of biological data and is in direct response to the growing biological components of the water quality monitoring and survey studies being conducted.

To date the Water Quality Branch has prepared or has participated in the preparation of seventeen reports, publications and/or presentations utilizing water quality data and aquatic information gathered in Newfoundland. These are listed in Appendix XXIV.

OUTLOOK FOR THE FUTURE

The Water Quality Branch has conducted a number of aquatic environmental studies in Newfoundland over the past twenty years, however there is still a lot of work to be done. The vastness of the Province, the hydrological variability and the severity of the winter makes the collection of aquatic environment data difficult, time consuming, and manpower intensive. Yet, these dynamic hydrological conditions make it necessary to maintain on-going monitoring programs in order to keep water quality data relevant to current needs.

Awareness within the scientific community and the public at large of the susceptibility of the aquatic environment to degradation has increased in recent years. This has resulted in a shift of emphasis from routine ambient water quality monitoring to issue oriented studies. Analysis of Departmental priorities indicate that future Water Quality Branch activities in Newfoundland will most likely focus on the following:

(1) Toxic substances;
(2) Long range transport of atmospheric pollutants;
(3) Federal/Provincial co-operation in data acquisition, analysis, storage, interpretation and dissemination; and
(4) Development of Water Quality Objectives in selected river basins.

It is felt that through increased federal/provincial cooperation, effected by joint planning and work sharing, the future could be more productive for both levels of government. This is the opportunity we are now presented with and should be exploring in order to meet future requirements.

TABLE 1

Summary of WQB Projects

1965-1985

APPENDIX #	PROJECT TITLE	SAMPLING PERIOD	STATIONS	SAMPLE ON FILE	FREQUENCY OF SAMPLING
II	I.H.D. National Water Quality Monitoring	1965-1974	24	989	Monthly
III	I.H.D. Research Basin Study	1970-1974	1	48	Monthly
IV	WQB National Water Quality Monitoring	1974-1978	23	763	Monthly
V	Atlantic Region Overview Network	1978-1985	12	760	Monthly or bimonthly
VI	Labrador Water Quality Survey	1980	6	6	Once
VII	Acid Rain Sensitivity Mapping	1976-1978	600	600	Once
VIII	Pollutant Specific Surveys	1980-1982	18	61	Irregular
IX	Labrador-Quebec Interprovincial Waters	1980-1984	21	211	2 weeks/year
X	Waterford River Basin Urban Hydrology Study	1980-1985	8	730	at least monthly
XI	LRTAP Lakes Monitoring	1983-1985	33	198	2/year
XII	Toxic Chemical Survey	1984	14	66	2 weeks
XIII	Municipal Water Toxic Chemical Survey	1985	10	20	2/year
			TOTAL	4452	

TABLE 2

WQB SUPPORTED PROJECTS[a]

1965-1985

PROJECT TITLE	CLIENT	NUMBER OF STATIONS	SAMPLING PERIOD	APPROX. # OF SAMPLES
Exploit River Survey	DFO	17	1967-1968	169
Special Study	DFO	13	1971	18
Exploit River Survey	Consultant	18	1967-1969	36
Exploit River Survey	Prov. Dept. of Health	2	1966-1969	2
Regional Studies	Fed. Public Health Eng.	5	1971	5
Special Studies	Prov. Water Auth.	50	1971	50
Radioisotope Monitoring	NWRI	1	1982-1985	12
			TOTAL	292

a = Other projects were supported in the late sixties and early seventies but the data for these were not placed on NAQUADAT.

TABLE 3

Station Listing

NAQUADAT #	DESCRIPTION	APPROX. # OF SAMPLES
00NF02YA0001	St. Genevieve River near Foresters Point	76
00NF02YC0001	Torrent River at Bristol's Pool	128
00NF02YD0001	Beaver Brook near Roddicton	73
00NF02YF0001	Cat Arm River at Lake Outlet	28
00NF02YJ0001	Harry's River at Black Duck	197
00NF02YK0001	Grand Lake discharge Canal	114
00NF02YL0001	Upper Humber River at Seil Pond near Reidville	73
00NF02YM0001	Indian Brook near Springdale	174
00NF02YN0005	Buchans Brook at Hwy Bridge	3
00NF02YO0001	Exploits River at Grand Falls	237
00NF02YO0014	Exploits River, 0.6 km below Millertown dam	5
00NF02YO0015	Exploits River, 100 m below Island, 3.5 km of upstream Badger	6
00NF02YO0016	Exploits River, 0.5 km above confluence of Aspen Brook	3
00NF02YO0017	Exploits River at Bishops Falls, 0.5 km above TCH Bridge	3
00NF02YQ0001	Gander River at Glendwood	90
00NF02YS0001	Terra Nova River at Terra Nova	106
00NF02ZB0001	Isle aux Morts River at Isle aux Morts	171
00NF02ZC0001	Grandy Brook 600 m below Top Pond Brook	45
00NF02ZD0003	Grey River below Salmon Brook	62
00NF02ZE0004	Salmon River at Long Pond	94

Table 3 (cont'd)

NAQUADAT #	DESCRIPTION	APPROX. # OF SAMPLES
00NF02ZF0009	Bay du Nord River at Big Falls	24
00NF02ZG0016	Garnish River near Garnish	170
00NF02ZG0021	Grand Bank Water Supply - Grand Bank Brook at Dam at intake	2
00NF02ZG0022	Rushoon Water Supply - Big Pond Brook at dam at intake	2
00NF02ZG0023	St. Lawrence water supply - St. Lawrence River at dam near intake	2
00NF02ZH0001	Pipers Hole River at Mothers Brook	198
00NF02ZH0009	Come-by-Chance River near Goobies	74
00NF02ZK0001	Rocky River at Hwy 6 Bridge at Colinet	222
00NF02ZK0004	Arnold's Cove Water Supply - Unnamed Brook at dam at intake	2
00NF02ZM0001	South Brook at Culvert on Ruby Line Road	60
00NF02ZM0002	Northeast Pond River near Portugal Cove	95
00NF02ZM0003	Waterford R. at Donovans (past industrial park)	60
00NF02ZM0004	Waterford River at Commonwealth Avenue Bridge	60
00NF02ZM0006	Brook at Agriculture Canada Farm	60
00NF02ZM0007	South Brook at Heavy Tree Road	60
00NF02ZM0008	Tributary of South Brook draining Deadmans Pond (at bridge next to 95 Old Bay Bulls Road)	60
00NF02ZM0009	Waterford River at Kilbride	310
00NF02ZM0012	Waterford River at Bridge on Dunns Road	60

Table 3 (cont'd)

NAQUADAT #	DESCRIPTION	APPROX. # OF SAMPLES
00NF02ZN0001	Trepassey Water Supply - Northeast Brook near intake to Pumping Station	2
00NF03B00001	Churchill (Hamilton) River at Flour Lake	17
00NF030D0001	Unnamed (KONAK) River at Twin Falls	8
00NF03E00001	Churchill (Hamilton) River at Muskrat Falls	46
00NF03E00003	Churchill River at Gull Island Falls	1
00NF03PB0001	Naskaupi River at Fremont Lake	8
00NF03QC0001	Eagle River above Eagle Falls	50
00NF03QC0002	Alexis River near Port Hope Simpson	1
00NF02XA0001	Little Mecatina River above Lac Fourmont	1
00NF02XA0002	River Joir above Lac Donquan	1
00NF02XA0003	Rivière Joir approx. 1 km upstream of confluence with Little Mecatina River	7
01NF02WB0004	Lac Fonteneau, 320 m North of Labrador-Quebec Boundary	7
01NF02XA0002	Lac Donquan approx. 1.9 km S. E. of inlet of Little Mecatina River	7
01NF02XA0003	Lac Donquan approx. 3.9 km S. E. of inlet of Little Mecatina River	7
01NF02XA0004	Lac Donquan at lake outlet approx. 1.3 km south of Quebec-Labrador boundary	7
01NF02XA0005	Lac Donquan at inlet of Little Mecatina River	7
01NF02XB0002	St. Augustin River headwater lake (unnamed) approximately 0.8 km down-lake from northern end	14

Table 3 (cont'd)

NAQUADAT #	DESCRIPTION	APPROX. # OF SAMPLES
01NF02XB0003	St. Augustin River headwater lake (unnamed) approximately 1.5 km down-lake from northern end	14
01NF02XB0004	St. Augustin River headwater lake (unnamed) near center of large eastern bay	14
01NF02XB0005	St. Augustin River headwater lake (unnamed) approximately 0.8 km up-lake from outlet to St. Augustin River	14
01NF02XC0007	St. Paul River headwater lake (unnamed) approximately 150 m from lake outlet	9
01NF02XC0008	St. Paul River headwater lake (unnamed) approx. 3 km up-lake from outlet near center of large western bay	9
01NF02XC0009	St. Paul River headwater lake (unnamed) approx. 3.2 km up-lake from outlet near entrance to southern bay	9
01NF02XC0010	St. Paul River headwater lake (unnamed) approx. 4.5 km up-lake from outlet near center of southern bay	9
01NF02YH0001	Wigwam Pond, Gros Morne N. P.	6
01NF02YH0011	Gros Morne #26, Gros Morne N. P.	6
01NF02YH0012	Gros Morne #24, Gros Morne N. P.	6
01NF02YH0013	Gros Morne #25, Gros Morne N. P.	6
01NF02YH0014	Gros Morne #21, Gros Morne N. P.	6
01NF02YH0015	Gros Morne #22, Gros Morne N. P.	6
01NF02YK0006	Glover Island Unnamed Pond	6
01NF02YL0001	Unnamed Pond East of Adies Pond	6
01NF02YL0009	Deer Lake near South Brook, 1.8 km ENE of Governors Point at Center	6
01NF02YL0010	Gros Morne #23, Gros Morne N. P.	6
01NF02YM0001	Noble Pond near East Outlet	6

Table 3 (cont'd)

NAQUADAT #	DESCRIPTION	APPROX. # OF SAMPLES
01NF02YM0003	Unnamed Pond North of Upper Indian Pond	6
01NF02YM0006	Unknown Pond Northwest of Middle Arm White Bay	6
01NF02YM0007	Sandy Lake Northwest of Burlington	6
01NF02YN0001	Red Indian Lake, 1.5 km W of Millertown Dam	6
01NF02YN0008	Sandy Lake Southwest of Buchans Island	6
01NF02YN0013	Red Indian Lake near Millertown 4.8 km WNW of Exploits River Dam at Center	6
01NF02YN0020	Red Indian Lake, 1 km E of Buchans Island	5
01NF02YN0021	Red Indian Lake, 5 km SE of Buchans Brook near Center	5
01NF02YN0022	Red Indian Lake, 5 km WNW of Millertown Dam	5
01NF02YN0023	Red Indian Lake, 1.8 km NW of Millertown Dam	6
01NF02YN0024	Red Indian Lake, 4 km W of Millertown at Center	5
01NF02YO0009	Tally Pond at South Dam	6
01NF02YQ0001	Bellman's Pond near Dam	6
01NF02YQ0014	Gander Lake 100 m from Northern Shore of Lake, NW of Bluff Head	6
01NF02YR0005	Unknown Pond near Little Ocean Pond	6
01NF02YS0003	Rattle Pond, Terra Nova N. P.	6
01NF02YS0005	Shallow Ponds in Terra Nova N. P.	6
01NF02YS0009	Ochre Hill Pond, Terra Nova N. P.	6
01NF02YS0010	Chatman Pond West, Terra Nova N. P.	6
01NF02YS0016	Pond near South Broad Cove, Terra Nova N. P.	6

Table 3 (cont'd)

NAQUADAT #	DESCRIPTION	APPROX. # OF SAMPLES
01NF02YS0021	"Bog" Pond, Terra Nova N. P.	6
01NF02YS0029	Long Waters (South), Terra Nova N. P.	6
01NF02YS0045	Jay Pond, Terra Nova N. P.	6
01NF02YS0048	Moses Cove Pond, Terra Nova N. P.	6
01NF02YS0060	Terra Nova Lake 2.7 km W of RR Bridge at Center (power line)	6
01QU02VC0001	Lac Brulé (Romaine River) approximately 5.5 km downlake from inflow	14
01QU02VC0002	Lac Brulé (Romaine River) approx. 8.7 km downlake from inflow	14
01QU02VC0003	Lac Brulé (Romaine River) approx. 18 km downlake from inflow	14
01QU02VC0004	Lac Brulé (Romaine River) approx. 26 km downlake from inflow	14
01NF02ZB0001	Big Pond at North outlet	6
01NF02ZB0002	Pond Northeast of White Bear Bay	6
01NF02ZC0003	Stephensons Pond at North tip	6
01NF02ZD0001	Pond near Dolland Brook	6
01NF02ZD0002	Pond near Wolf Lake	6
01NF02ZF0003	Pond North of Gisbourne Lake	6
01NF02ZF0004	Hungry Grove Pond North outlet	6
01NF02ZG0005	Marystown Water Supply - Linton Lake at intake to treatment plant	2
01NF02ZK0006	Dunville Water Supply - Wyse's Pond at outlet to Treatment plant	2
01NF02ZL0002	Harbour Grace Water Supply - Bannerman Lake at outlet to Treatment plant	2
01NF02ZL0003	Hearts Desire Water Supply - Terrence Pond at outlet to Treatment plant	2
01NF02ZM0031	St. John's Water Supply - Windsor Lake near Intake near Thorburn Road	2

Table 3 (cont'd)

NAQUADAT #	DESCRIPTION	APPROX. # OF SAMPLES
01QU02WB0001	Lac Fonteneau, 23 km South of interprovincial boundary	7
01QU02WB0002	Lac Fonteneau, 9 km South of interprovincial boundary	7
01QU02WB0003	Lac Fonteneau, 3 km South of interprovincial basin	7
02NF02YO0001	Bay of Exploits near Mouth of Norris Arm 1.1 km SW of High Point	6
03NF02YK0001	Humber Arm at Church Cove	2
03NF02YJ0001	Port Harmon at edge of channel	2
03NF02YO0001	Lewisport Harbour 100 m W of main wharf	2
03NF02YO0012	Bay of Expoits, 1.3 km SW of High Point (near center of headlands)	5
03NF02YO0023	Bay of Exploits, midway between Wigwam and Little Peter Points, 0.5 km from Shore	6
03NF02ZB0001	Port aux Basques Harbour, 100 m SW of Money Island	6
03NF02ZM0001	St. John's Harbour at Pier 31	2
03NF02ZM0003	St. John's Harbour, 170 m N of Irving Pier 24	6
03NF02ZM0004	St. John's Harbour, 70 m SE of Pier 8 near Bowring Bros.	6

APPENDIX I

FEDERAL LEGISLATIVE ACTS RELATED TO WATER

- British North America Act
- Boundary Waters Treaty Act (1909)
- International River Improvement Act (1955)
- Canada Water Act (1970)
- Northern Inland Waters Act (1972)
- Artic Waters Pollution Prevention Act (1972)
- Fisheries Act (amended in 1977)
- Canada Shipping Act
- Navigable Waters Protection Act
- Department of Environment Act (1971)
- Environmental Contaminants Act (1975)
- National Parks (Canada) Act
- National Harbours Act
- Migratory Birds Convention Act (1916)
- Government Organization Act (1979)

APPENDIX II

PROJECT DESCRIPTION

WATER QUALITY BRANCH

ATLANTIC REGION

PROJECT TITLE: I.H.D. National Water Quality Monitoring

SUBMITTER I.D.: 0001

PERIOD: April 1965 - March 1974

OBJECTIVES: To establish and maintain a water quality and pollution evaluation network in Newfoundland and to obtain a province-wide baseline inventory of surface water quality.

FIELD SAMPLING: Lay collectors

PARAMETERS ANALYSED: Physical parameters, major ions, nutrients and metals.

STATIONS SAMPLED:

STATION[a] #	NAQUADAT #	DESCRIPTION	APPROX. # OF SAMPLES ANALYZED
1	00NF02YA0001	St. Genevieve River near Foresters Point	30
2	00NF02YC0001	Torrent River at Bristol's Pool	36
3	00NF02YD0001	Beaver Brook near Roddicton	33
4	00NF02YF0001	Cat Arm River at Lake Outlet	14
5	00NF02YJ0001	Harry's River at Black Duck	73
6	00NF02YK0001	Grand Lake discharge Canal	79

APPENDIX II Cont'd

STATION #	NAQUADAT #	DESCRIPTION	APPROX # OF SAMPLES ANALYZED
7	00NF02YL0001	Upper Humber River near Reidville	30
8	00NF02YM0001	Indian Brook near Springdale	35
9	00NF02YO0001	Exploits River at Grand Falls	96
10	00NF02YQ0001	Gander River at Glenwood	60
11	00NF02YS0001	Terra Nova River at Terra Nova	71
12	00NF02ZB0001	Isle aux Morts River at Isle aux Morts	84
13	00NF02ZD0003	Grey River below Salmon Brook	9
14	00NF02ZE0004	Salmon River at Long Pond	40
15	00NF02ZF0009	Bay du Nord River at Big Falls	12
16	00NF02ZG0016	Garnish River near Garnish	34
17	00NF02ZH0001	Pipers Hole River at Mothers Brook	71
18	00NF02ZH0009	Come-by-Chance River near Goobies	32
19	00NF02ZK0001	Rocky River at Hwy 6 Bridge at Colinet	87
20	00NF03BO0001	Churchill (Hamilton) River at Flour Lake	14
21	00NF03OD0001	Unnamed (KONAK) River at Twin Falls	8
22	00NF03OE0001	Churchill (Hamilton) River at Muskrat Falls	15

APPENDIX II Cont'd

STATION #	NAQUADAT #	DESCRIPTION	APPROX # OF SAMPLES ANALYZED
23	00NF03PB0001	Naskaupi River at Fremont Lake	8
24	00NF03QC0001	Eagle River above Eagle Falls	18

a = For detailed location of stations, refer to Map #1.

APPENDIX III

PROJECT DESCRIPTION

WATER QUALITY BRANCH

ATLANTIC REGION

PROJECT TITLE: I.H.D. Research Basin Study

SUBMITTER I.D.: 0021

PERIOD: May 1970 - March 1974

OBJECTIVES: To gather data in order to better understand the relationships of the interconnected parameters of the hydrological cycle and their effects on the water balance of basins in a maritime climate.

FIELD SAMPLING: Lay collectors

PARAMETERS ANALYZED: Physical parameters, major ions, nutrients and metals

STATIONS SAMPLED:

STATION[a] #	NAQUADAT #	DESCRIPTION	APPROX # OF SAMPLES ANALYZED
1	00NF02ZM0002	Northeast Pond River near Portugal Cove	48

a = For detailed location of station, refer to Map #2.

APPENDIX IV

PROJECT DESCRIPTION

WATER QUALITY BRANCH

ATLANTIC REGION

PROJECT TITLE: WQB National Water Quality Monitoring

SUBMITTER I.D.: 0001

PERIOD: April 1974 - March 1978

OBJECTIVES: To collect, analyze and store background surface water quality data for later interpretation.

FIELD SAMPLING: Lay collectors

PARAMETERS ANALYZED: Physical parameters, major ions, nutrients and metals

STATIONS SAMPLED:

STATION[a] #	NAQUADAT #	DESCRIPTION	APPROX # OF SAMPLES ANALYZED
1	00NF02YA0001	St. Genevieve River near Foresters Point	36
2	00NF02YC0001	Torrent River at Bristol's Pool	46
3	00NF02YD0001	Beaver Brook near Roddicton	40
4	00NF02YF0001	Cat Arm River at lake Outlet	14
5	00NF02YJ0001	Harrys River at Black Duck	33
6	00NF02YK0001	Grand Lake Discharge Canal	35
7	00NF02YL0001	Upper Humber River at Seal Pond near Reidville	43
8	00NF02YM0001	Indian Brook near Springdale	48

APPENDIX IV Cont'd

STATION #	NAQUADAT #	DESCRIPTION	APPROX # OF SAMPLES ANALYZED
9	00NF02YO0001	Exploits River at Grand Falls	48
10	00NF02YQ0001	Gander River at Glenwood	30
11	00NF02YS0001	Terra Nova River at Terra Nova	35
12	00NF02ZB0001	Isle aux Morts River at Isle aux Morts	42
13	00NF02ZD0003	Grey River below Salmon Brook	8
14	00NF02ZE0004	Salmon River at Long Pond	54
15	00NF02ZF0009	Bay du Nord River at Big Falls	12
16	00NF02ZG0016	Garnish River near Garnish	46
17	00NF02ZH0001	Pipers Hole River at Mothers Brook	36
18	00NF02ZH0009	Come-by-Chance River near Goobies	42
19	00NF02ZK0001	Rocky River at Hwy 6 Bridge at Colinet	44
20	00NF03BO0001	Churchill (Hamilton) River at Flour Lake	3
21	00NF03OE0001	Churchill (Hamilton) River at Muskrat Falls	10
22	00NF03QC0001	Eagle River above Eagle Falls	11
23	00NF02ZM0002	Northeast Pond River near Portugal Cove	47

a = For detailed location of stations, refer to Map #3.

APPENDIX V

PROJECT DESCRIPTION

WATER QUALITY BRANCH

ATLANTIC REGION

PROJECT TITLE: Atlantic Region Overview Network

SUBMITTER I.D.: 0099

PERIOD: July 1978 - Present

OBJECTIVES: To collect and analyze aquatic environmental quality data in order to maintain a Regional inventory of baseline information for:

(i) the periodic assessment of the quality of the aquatic environment;

(ii) the determination of long term trends in the aquatic environment; and

(iii) the fulfillment of our commitment to supply international agencies with ocean input data.

FIELD SAMPLING: Water Resources Branch staff

PARAMETERS ANALYZED: Physical parameters, major ions, nutrients and metals

STATIONS SAMPLED:

STATION[a] #	NAQUADAT #	DESCRIPTION	APPROX # OF SAMPLES ANALYZED
1	00NF02YC0001	Torrent River at Bristol's Pool	45
2	00NF02YJ0001	Harry's River at Black Duck	90
3	00NF02ZH0001	Pipers Hole River at Mothers Brook	90
4	00NF02ZK0001	Rocky River at Colinet	90

APPENDIX V Cont'd

STATION #	NAQUADAT #	DESCRIPTION	APPROX # OF SAMPLES ANALYZED
5	00NF02YO0001	Exploits River at Grand Falls	90
6	00NF02YM0001	Indian Brook near Springdale	90
7	00NF03QC0001	Eagle River above Eagle Falls	20
8	00NF03OE0001	Churchill (Hamilton) River at Muskrat Falls	20
9	00NF02ZB0001	Isle aux Morts River	45
10	00NF02ZD0003	Grey River	45
11	00NF02ZG0016	Garnish River	90
12	00NF02ZC0001	Grandy Brook	45

a = For detailed location of stations, refer to Map #4.

APPENDIX VI

PROJECT DESCRIPTION

WATER QUALITY BRANCH

ATLANTIC REGION

PROJECT TITLE: Labrador Water Quality Survey

SUBMITTER I.D.: 0085

PERIOD: Sept. 10-16, 1978

OBJECTIVE: To collect baseline water quality data from two major interprovincial waters and from waters situated in areas of potential energy development.

FIELD SAMPLING: Water Quality Branch staff

PARAMETERS ANALYZED: Physical parameters, major ions, nutrients and metals

STATIONS SAMPLED:

STATION[a] #	NAQUADAT #	DESCRIPTION	APPROX # OF SAMPLES ANALYZED
1	00NF02XA0001	Little Mecatina River above Lac Fourmont (WSC Gauge)	1
2	00NF02XA0002	River Joir above Lac Donquan (WSC Gauge)	1
3	00NF03QC0002	Alexis River near Port Hope Simpson (WSC Gauge)	1
4	00NF03OE0003	Churchill River at Gull Island Falls (WSC Gauge)	1
5	00NF03OE0001	Churchill (Hamilton) River at Muskrat Falls	1
6	00NF03QC0001	Eagle River above Eagle Falls	1

a = For detailed location of stations, refer to Map #5.

APPENDIX VII

PROJECT DESCRIPTION

WATER QUALITY BRANCH

ATLANTIC REGION

PROJECT TITLE:	Acid Rain Sensitivity Mapping
SUBMITTER I.D.:	0230
PERIOD:	1976 - 1978
OBJECTIVES:	To gather, store and analyze existing water quality data in order to prepare acid rain sensitivity maps based on Calcite Saturation Indices.
FIELD SAMPLING:	Samples were collected by the Federal Department of Fisheries and Oceans but analyzed by the WQB.
PARAMETERS ANALYZED:	Physical parameters and major ions.
STATIONS SAMPLED:	A total of 600 stations were sampled on a once only basis.

APPENDIX VIII

PROJECT DESCRIPTION

WATER QUALITY BRANCH

ATLANTIC REGION

PROJECT TITLE: Pollutant Specific Surveys

SUBMITTER I.D.: 0211

PERIOD: 1980 - 1982

OBJECTIVES: To locate, characterize and quantify the extent of contamination by toxic substances in the aquatic environment, thereby providing information which can be used for the planning, development and implementation of preventative measures, controls and clean up.

FIELD SAMPLING: Water Quality Branch staff

PARAMETERS ANALYZED:

a) Water
- Pentachlorophenols
- Chlorobenzenes
- Phthalate esters
- Lead
- Mirex
- Arsenic

b) Bottom Sediments
- Chlorobenzenes
- Mirex
- Phthalate esters
- PCBs
- Cadmium
- Lead
- Mercury
- PAHs
- Carbofuran
- Fenitrothion

APPENDIX VIII Cont'd

STATIONS SAMPLED:

STATION[a] #	NAQUADAT #	DESCRIPTION	APPROX # OF SAMPLES ANALYZED
1	00NF02ZK0001	Rocky River at Hwy 6 Bridge at colinet	1 (water)
2	00NF02YM0001	Indian Brook near Springdale	1 (water)
3	03NF02YK0001	Humber Arm at Church Cove	1 (water) 1 (sediments)
4	03NF02YJ0001	Port Harmon at edge of channel	1 (water)
5	00NF02YC0001	Torrent River at Bristol Pool	1 (water)
6	00NF02YO0001	Exploits River at Grand Falls	1 (water)
7	03NF02ZM0001	St. John's Harbour at Pier 31	1 (water) 1 (sediments)
8	00NF02ZH0001	Piper's Hole River at Mothrs Brook	1 (water)
9	03NF02YO0001	Lewisport Harbour	1 (water) 1 (sediments)
10	00NF02YJ0001	Harrys River at Black Duck	1 (water)
11	03NF02ZB0001	Port aux Basques Harbour, 100 m SW of Money Island	3 (water) 3 (sediments)
12	01NF02YL0009	Deer Lake near South Brook, 1.8 km ENE of Governors Point at Center	3 (water) 3 (sediments)
13	01NF02YN0013	Red Indian Lake near Millertown 4.8 km WNW of Exploits River Dam at Center	3 (water) 3 (sediments)
14	02NF02YO0001	Bay of Exploits near Mouth of Norris Arm 1.1 km SW of High Point	3 (water) 3 (sediments)
15	01NF02YQ0014	Gander Lake 100 m from Northern Shore of Lake, NW of Bluff Head	3 (water) 3 (sediments)

APPENDIX VIII Cont'd

STATION[a] #	NAQUADAT #	DESCRIPTION	APPROX # OF SAMPLES ANALYZED
16	01NF02YS0060	Terra Nova Lake 2.7 km W of RR Bridge at Center (power line)	3 (water) 3 (sediments)
17	03NF02ZM0003	St. John's Harbour, 170 m N of Irving Pier 24	3 (water) 3 (sediments)
18	03NF02ZM0004	St. John's Harbour, 70 m SE of Pier 8 near Bowring Bros.	3 (water) 3 (sediments)

a = For detailed location of stations, refer to Map #6.

APPENDIX IX

PROJECT DESCRIPTION

WATER QUALITY BRANCH

ATLANTIC REGION

PROJECT TITLE: Labrador/Quebec Interprovincial Waters

SUBMITTER I.D.: 0085

PERIOD: September 1980 to September 1984

OBJECTIVES: To conduct a baseline aquatic quality study of rivers and lakes located at the Newfoundland/Quebec border.

FIELD SAMPLING: Water Quality branch staff

PARAMETERS ANALYZED: Physical parameters, major ions, nutrients, mercury, metals, PCB and chlorinated hydrocarbons. Water, sediment and biota samples were collected.

STATIONS SAMPLED:

STATION[a] #	NAQUADAT #	DESCRIPTION	APPROX # OF SAMPLES ANALYZED
1	01NF02XA0005	Lac Donquan at inlet of Little Mecatina River	1 (water) 2 (sediments) 4 (fish)
2	01NF02XA0002	Lac Donquan approx. 1.9 km S.E. of inlet of Little Mecatina River	1 (water) 3 (sediments) 4 (fish)
3	01NF02XA0003	Lac Donquan approx. 3.9 km S.E. of inlet of Little Mecatina River	1 (water) 3 (sediments) 4 (fish)
4	01NF02XA0004	Lac Donquan at lake outlet approx. 1.3 km south of Quebec-Labrador boundary	1 (water) 3 (sediments) 4 (fish)
5	00NF02XA0003	Riviere Joir approx. 1 km upstream of confluence with Little Mecatina River	1 (water) 2 (sediments) 4 (fish)

APPENDIX IX Cont'd

STATION #	NAQUADAT #	DESCRIPTION	APPROX # OF SAMPLES ANALYZED
6	01NF02WB0004	Lac Fonteneau, 320 m North of Labrador-Quebec Boundary	1 (water) 2 (sediments) 4 (fish)
7	01QU02WB0001	Lac Fonteneau, 23 km South of interprovincial boundary	1 (water) 2 (sediments) 4 (fish)
8	01QU02WB0002	Lac Fonteneau, 9 km South of interprovincial boundary	1 (water) 2 (sediments) 4 (fish)
9	01QU02WB0003	Lac Fonteneau, 3 km South of interprovincial basin	1 (water) 2 (sediments) 4 (fish)
10	01QU02VC0001	Lac Brulé (Romaine River) approximately 5.5 km down-lake from inflow	1 (water) 3 (sediments) 10 (fish)
11	01QU02VC0002	Lac Brulé (Romaine River) approximately 8.7 km down-lake from inflow	1 (water) 3 (sediments) 10 (fish)
12	01QU02VC0003	Lac Brulé (Romaine River) approximately 18 km down-lake from inflow	1 (water) 3 (sediments) 10 (fish)
13	01QU02VC0004	Lac Brulé (Romaine River) approximately 26 km down-lake from inflow	1 (water) 3 (sediments) 10 (fish)
14	01NF02XB0002	St. Augustin River headwater lake (unnamed) approximately 0.8 km down-lake from northern end	1 (water) 3 (sediments) 10 (fish)
15	01NF02XB0003	St. Augustin River headwater lake (unnamed) approximately 1.5 km down-lake from northern end	1 (water) 3 (sediments) 10 (fish)
16	01NF02XB0004	St. Augustin River headwater lake (unnamed) near center of large eastern bay	1 (water) 3 (sediments) 10 (fish)

APPENDIX IX Cont'd

STATION #	NAQUADAT #	DESCRIPTION	APPROX # OF SAMPLES ANALYZED
17	01NF02XB0005	St. Augustin River headwater lake (unnamed) approximately 0.8 km up-lake from outlet to St. Augustin river	1 (water) 3 (sediments) 10 (fish)
18	01NF02XC0007	St. Paul River headwater lake (unnamed) approximately 150 m from lake outlet	1 (water) 3 (sediments) 5 (fish)
19	01NF02XC0008	St. Paul River headwaters lake (unnamed) approx. 3 km up-lake from outlet near center of large western bay	1 (water) 3 (sediments) 5 (fish)
20	01NF02XC0009	St. Paul River headwater lake (unnamed) approx. 3.2 km up-lake from outlet near entrance to southern bay	1 (water) 3 (sediments) 5 (fish)
21	01NF02XC0010	St. Paul River headwater lake (unnamed) approx. 4.5 km up-lake from outlet near center of southern bay	1 (water) 3 (sediments) 5 (fish)

a = For detailed location of stations, refer to Map #7.

APPENDIX X

PROJECT DESCRIPTION

WATER QUALITY BRANCH

ATLANTIC REGION

PROJECT TITLE: Waterford River Urban Hydrology Study

SUBMITTER I.D.: 0214

PERIOD: 1980 - 1985

OBJECTIVES: To study surface water quality in various areas of the Waterford River Basin under different hydrological conditions.

FIELD SAMPLING: Newfoundland Department of Environment

PARAMETERS ANALYZED: Physical parameters, major ions, nutrients, selected metals, total and fecal coliforms and fecal streptococci

STATIONS SAMPLED:

STATION[a] #	NAQUADAT #	DESCRIPTION	APPROX # OF SAMPLES ANALYZED
1	00NF02ZM0001	South Brook at Culvert on Ruby Line Road	60
2	00NF02ZM0003	Waterford R. at Donovans (past industrial park)	60
3	00NF02ZM0004	Waterford River at Commonwealth Avenue Bridge	60
4	00NF02ZM0006	Brook at Agriculture Canada Farm	60
5	00NF02ZM0007	South Brook at Heavy Tree Road	60
6	00NF02ZM0008	Tributary of South Brook draining Deadmans Pond (at bridge next to 95 Old Bay Bulls Road)	60

APPENDIX X Cont'd

STATION #	NAQUADAT #	DESCRIPTION	APPROX # OF SAMPLES ANALYZED
7	00NF02ZM0009	Waterford River at Kilbride	310
8	00NF02ZM0012	Waterford River at Bridge on Dunns Road	60

a = For detailed location of stations, refer to Map #8.

APPENDIX XI

PROJECT DESCRIPTION

WATER QUALITY BRANCH

ATLANTIC REGION

PROJECT TITLE: LRTAP Lakes Monitoring Project

SUBMITTER I.D.: 0244

PERIOD: 1983 to present

OBJECTIVES: To identify trends in acid precipitation parameters in Newfoundland Lakes

FIELD SAMPLING: Water Quality Branch staff

PARAMETERS ANALYZED: Field measurements, physical parameters, major ions, nutrients, and metals

STATIONS SAMPLED:

STATION[a] #	NAQUADAT #	DESCRIPTION	APPROX # OF SAMPLES ANALYZED
1	01NF02YH0001	Wigwam Pond	6
2	01NF02YH0011	Gros Morne #26	6
3	01NF02YH0012	Gros Morne #24	6
4	01NF02YH0013	Gros Morne #25	6
5	01NF02YH0014	Gros Morne #21	6
6	01NF02YH0015	Gros Morne #22	6
7	01NF02YK0006	Glover Isl. Pond	6
8	01NF02YL0001	East of Adies Pond	6
9	01NF02YL0010	Gros Morne #23	6
10	01NF02YM0001	Near Noble Pond	6
11	01NF02YM0003	North of Upper Indian Pond	6

APPENDIX XI Cont'd

STATION #	NAQUADAT #	DESCRIPTION	APPROX # OF SAMPLES ANALYZED
12	01NF02YM0006	Unknown Pond Northwest of Middle Arm White Bay	6
13	01NF02YM0007	Unknown Pond Northwest of Burlington	6
14	01NF02YN0008	Sandy Lake Southwest of Buchan's Lake	6
15	01NF02YO0009	Tally Pond at South Dam	6
16	01NF02YQ0001	Bellman's Pond near Dam	6
17	01NF02YR0005	Unknown Pond near Little Ocean Pond	6
18	01NF02YS0003	Rattle Pond, Terra Nova National Park	6
19	01NF02YS0005	Shallow Ponds in Terra Nova National Park	6
20	01NF02YS0009	Ochre Hill Pond, Terra Nova National Park	6
21	01NF02YS0010	Chatman Pond West, Terra Nova National Park	6
22	01NF02YS0016	Pond near South Broad Cove, Terra Nova National Park	6
23	01NF02YS0021	"Bog" Pond, Terra Nova National Park	6
24	01NF02YS0029	Long Waters (South), Terra Nova National Park	6
25	01NF02YS0045	Jay Pond, Terra Nova National Park	6
26	01NF02YS0048	Moses Cove Pond, Terra Nova National Park	6
27	01NF02ZB0001	Big Pond at North outlet	6
28	01NF02ZC0002	Pond Northwest of White Bear Bay	6

APPENDIX XI Cont'd

STATION #	NAQUADAT #	DESCRIPTION	APPROX # OF SAMPLES ANALYZED
29	01NF02ZC0003	Stephensons Pond at North tip	6
30	01NF02ZD0001	Pond near Dolland Brook	6
31	01NF02ZD0002	Pond near Wolf Lake	6
32	01NF02ZF0003	Pond North of Gisbourne Lake	6
33	01NF02ZF0004	Hungry Grove Pond North Outlet	6

a = For detailed location of stations, refer to Map #9.

APPENDIX XII

PROJECT DESCRIPTION

WATER QUALITY BRANCH

ATLANTIC REGION

PROJECT TITLE: Toxic Chemcial Survey

SUBMITTER I.D.: 0211

PERIOD: 1984

OBJECTIVES: To locate, characterize and quantify the extent of contamination by toxic substances in the aquatic environment, thereby providing information which can be used for the planning, development and implementation of preventative measures, controls, and clean up. Specifically, to screen for priority environmental contaminants in selected basins in Newfoundland.

FIELD SAMPLING: Water Quality Branch staff

PARAMETERS ANALYZED:

a) Water: Physical parameters, major ions, nutrients and selected metals

b) Sediments: Arsenic, mercury, copper, lead, zinc, cadmium, total organic carbon

c) Fish: Mercury, copper, lead, zinc, cadmium and lipid content

STATIONS SAMPLED:

STATION[a] #	NAQUADAT #	DESCRIPTION	APPROX # OF SAMPLES ANALYZED
1	00NF02YN0005	Buchans Brook at Hwy Bridge	3 (water)
2	00NF02YO0014	Exploits river, 0.6 km below Millertown dam	5 (water)
3	00NF02YO0015	Exploits River, 100 m below Island, 3.5 km of upstream Badger	6 (water)

APPENDIX XII Cont'd

STATION #	NAQUADAT #	DESCRIPTION	APPROX # OF SAMPLES ANALYZED
4	00NF02YO0016	Exploits River, 0.5 km above confluence of Aspen Brook	3 (water)
5	00NF02YO0001	Exploits River at Grand Falls	2 (water)
6	00NF02YO0017	Exploits River at Bishops Falls, 0.5 km above TCH Bridge	3 (water)
7	01NF02YN0001	Red Indian Lake, 1.5 km W of Millertown Dam	6 (fish)
8	01NF02YN0020	Red Indian Lake, 1 km E of Buchans Island	2 (water) 3 (sediments)
9	01NF02YN0021	Red Indian Lake, 5 km SE of Buchans Brook near Center	2 (water) 3 (sediments)
10	01NF02YN0022	Red Indian Lake, 5 km WNW of Millertown Dam	2 (water) 3 (sediments)
11	01NF02YN0023	Red Indian lake, 1.8 km NW of Millertown Dam	2 (water) 4 (sediments)
12	01NF02YN0024	Red Indian Lake, 4 km W of Millertown at Center	2 (water) 3 (sediments)
13	03NF02YO0012	Bay of Exploits, 1.3 km SW of High Point (near center of headlands)	1 (water) 4 (sediments)
14	03NF02YO0023	Bay of Exploits, midway between Wigwam and Little Peter Points, 0.5 km from Shore	2 (water) 4 (sediments)

a = For detailed location of stations, refer to Map #10.

APPENDIX XIII

PROJECT DESCRIPTION

WATER QUALITY BRANCH

ATLANTIC REGION

PROJECT TITLE: Municipal Water Toxic Chemical Survey

SUBMITTER I.D.: 0211

PERIOD: Started in May 1985

OBJECTIVES: To screen for specific environmental contaminants in Raw Domestic Water Sources in Newfoundland, and collect general water quality data.

FIELD SAMPLING: Done by a team composed of one Federal and one Provincial employee, twice a year (spring and fall).

PARAMETERS ANALYZED: Physical parameters, major ions, nutrients, aluminum, chromium, manganese, iron, nickel, copper, zinc, arsenic, cadmium, mercury, lead, organochlorine pesticides, PCBs, chlorinated benzenes, polyaromatic hydrocarbons, organophosphate pesticides, chlorinated phenols, aldicarb, and carbaryl.

STATIONS SAMPLED:

STATION[a] #	NAQUADAT #	DESCRIPTION	APPROX # OF SAMPLES ANALYZED
1	01NF02ZG0005	Marystown Water Supply - Linton Lake at intake to treatment plant	2
2	00NF02ZG0021	Grand Bank Water Supply - Grand Bank Brook at Dam at intake	2
3	00NF02ZG0022	Rushoon Water Supply - Big Pond Brook at dam at intake	2
4	00NF02ZG0023	St. Lawrence water supply - St. lawrence River at dam near intake	2

APPENDIX XIII Cont'd

STATION #	NAQUADAT #	DESCRIPTION	APPROX # OF SAMPLES ANALYZED
5	00NF02ZK0004	Arnold's Cove Water Supply - Unnamed Brook at dam at intake	2
6	01NF02ZK0006	Dunville Water Supply - Wyse's Pond at outlet to Treatment Plant	2
7	01NF02ZL0002	Harbour Grace Water Supply - Bannerman Lake at outlet to Treatment Plant	2
8	01NF02ZL0003	Hearts Desire Water Supply - Terrence Pond at outlet to Treatment Plant	2
9	01NF02ZM0031	St. John's Water Supply - Windsor Lake near Intake near Thorburn Road	2
10	00NF02ZN0001	Trepassey Water Supply - Northeast Brook near intake to Pumping Station	2

a = For detailed location of stations, refer to Map #11.

APPENDIX XIV

LIST OF REPORTS, PUBLICATIONS AND/OR PRESENTATIONS

(1) "Scope, Procedure and Interpretation of Survey Studies; J.F.J. Thomas, Industrial Water Resources of Canada, Water Survey Report No. 1 (1953).

(2) "The Hudson Bay, Labrador and Artic Drainage Basins, 1959-1965"; J.F.J. Thomas and R.M. Gale, Industrial Water Resources of Canada, Water Quality Report No. 15 (1973).

(3) "Surface Water Quality in Canada - An Overview"; Water Quality Branch, Inland Waters Directorate, Ottawa, Ont. (1977).

(4) "Acid Precipitation Sensitivity of Canada's Atlantic Provinces"; T.A. Clair, J.P. Witteman and S. Whitlow, presented at the American Society for Limnology and Oceanography Conference, Knoxville, Tennessee, Jan. (1980).

(5) "Toxic Substances in the Environment"; T.L. Pollock, presented to Science Council of N.B. Teachers' Association, Mount Allison University, Sackville, N.B., May 8 (1981).

(6) "Acid Precipitation Sensitivity of Canada's Atlantic Provinces"; T.A. Clair, J.P. Witteman and S.H. Whitlow, IWD Technical Bulletin No. 124 (1981).

APPENDIX XIV Cont'd

(7) "Analysis of LRTAP Water Samples"; T.L. Pollock, Presented to EPS-Nfld., District LRTAP Workshop, St. John's, Nfld., Sept. 22 (1981).

(8) "Water Quality Branch Activities in Newfoundland: 1965-1980"; P.E. Belliveau and V.A. Komadina, IWD-AR-WQB-82-26, Water Quality Branch, Inland Waters Directorate, Atlantic Region, Moncton, N.B., Apr. 15 (1982).

(9) "Data Report: Water Quality of Surface Waters of Newfoundland Labrador"; T.A. Clair, D.R. Engstrom and W. Whitman, IWD-AR-WQB-82-32, Water Quality Branch, Inland Waters Directorate, Atlantic Region, Moncton, N.B., Nov. (1982).

(10) "Trends in pH, Calcium and Sulfate of Rivers in Atlantic Canada"; T.A. Clair and P.H. Whitfield, Limnol. Oceanogr. 28(1), 160 (1983).

(11) "Survey of Toxic Inorganic Constituents in the Atlantic Region's Aquatic Environment"; P.E. Belliveau and H.S. Bailey, IWD-AR-WQB-83-40, Water Quality Branch, Inland Waters Directorate, Atlantic Region, Moncton, N.B., Mar. (1983).

APPENDIX XIV Cont'd

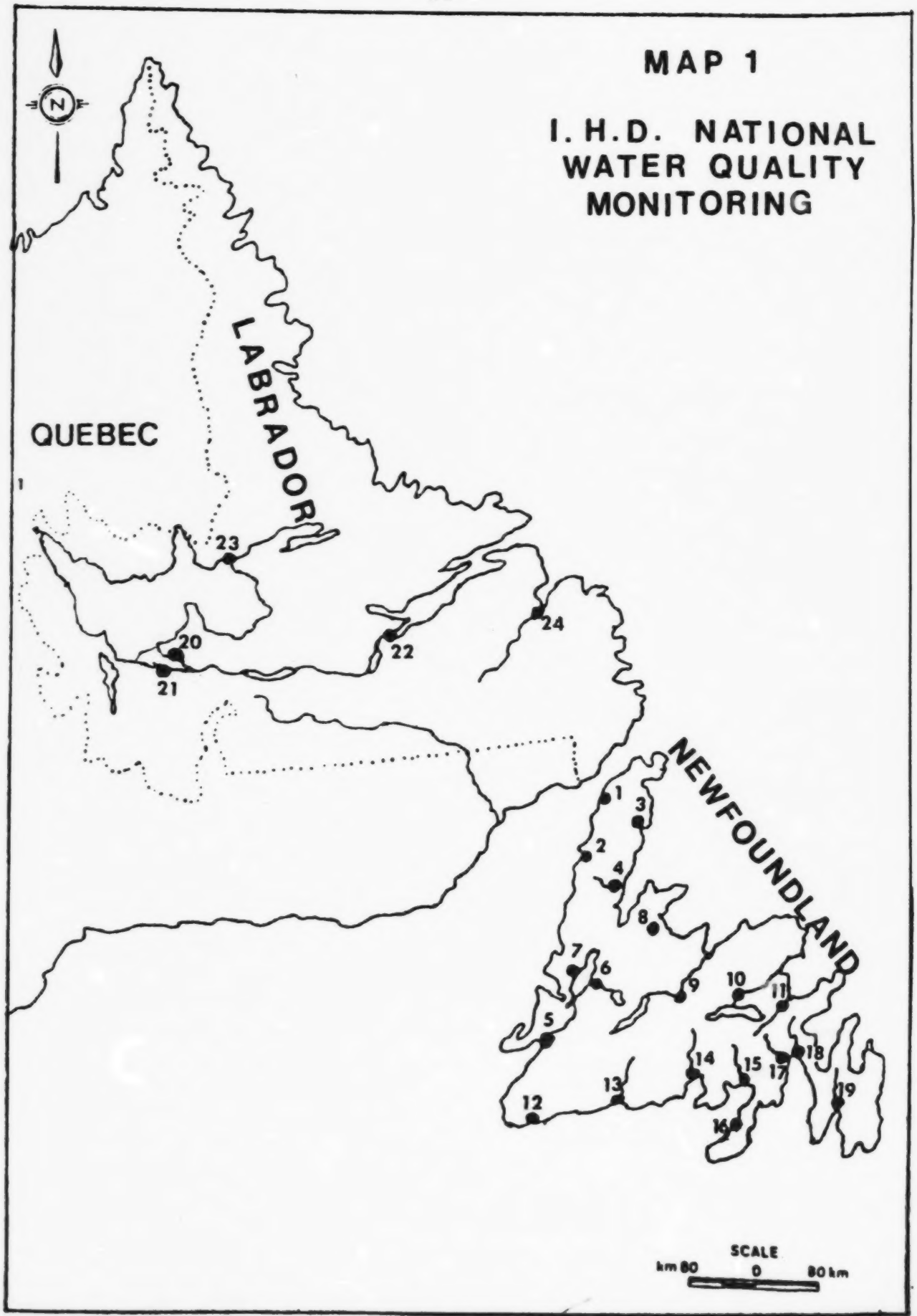
(12) "Survey of Toxic Organic Constituents in the Atlantic Region's Aquatic Environment (1979-81)"; H.S. Bailey and G.D. Howell, IWD-AR-WQB-83-48, Water Quality Branch, Inland Waters Directorate, Atlantic Region, Moncton, N.B., Oct. (1983).

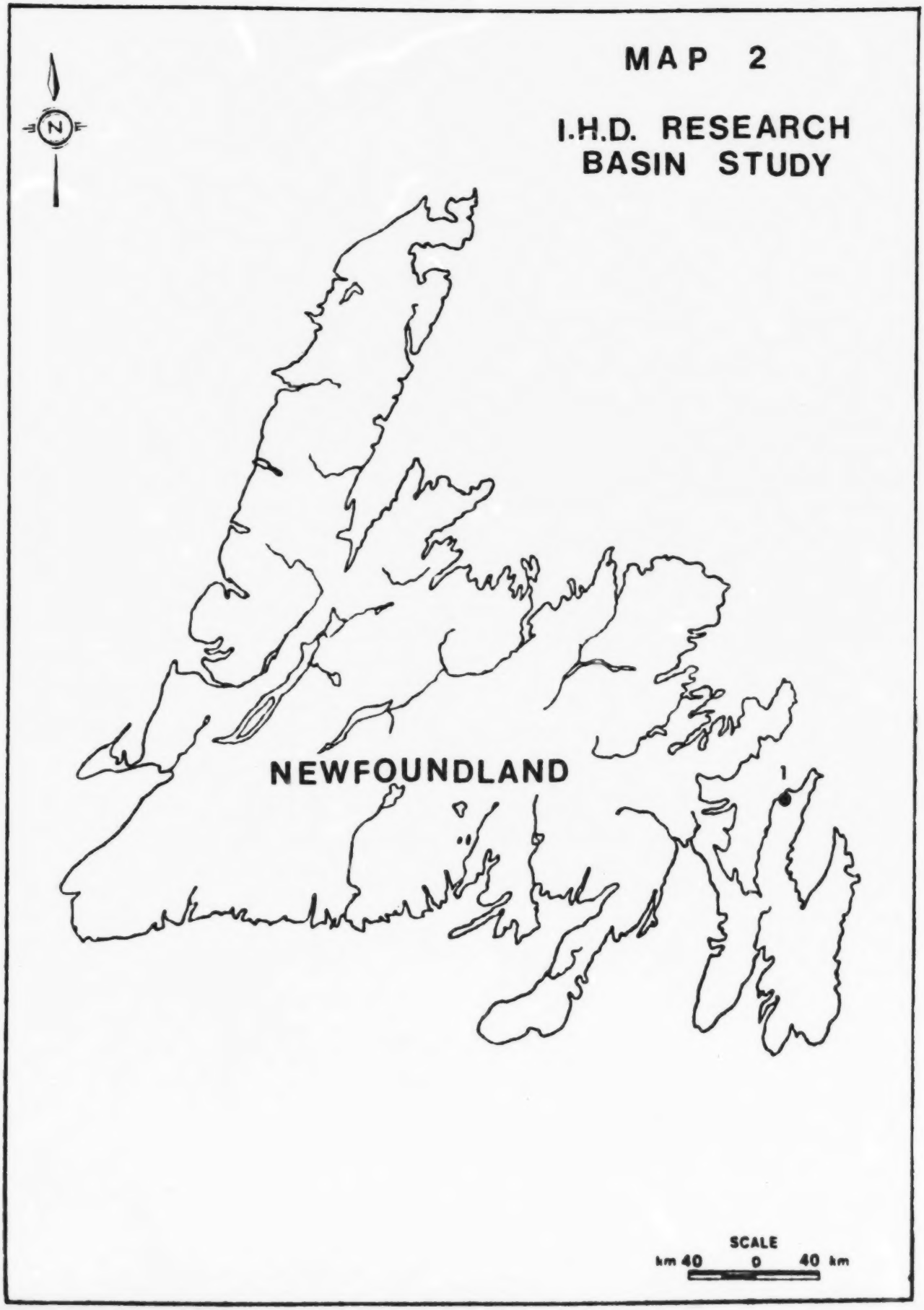
(13) "Water Quality of the Labrador-Quebec Watersheds: Little Mecatina and Natashquan Rivers"; D.M. Lockerbie and T.A. Clair, IWD-AR-WQB-83-51, Water Quality Branch, Inland Waters Directorate, Atlantic Region, Moncton, N.B., December 20 (1983).

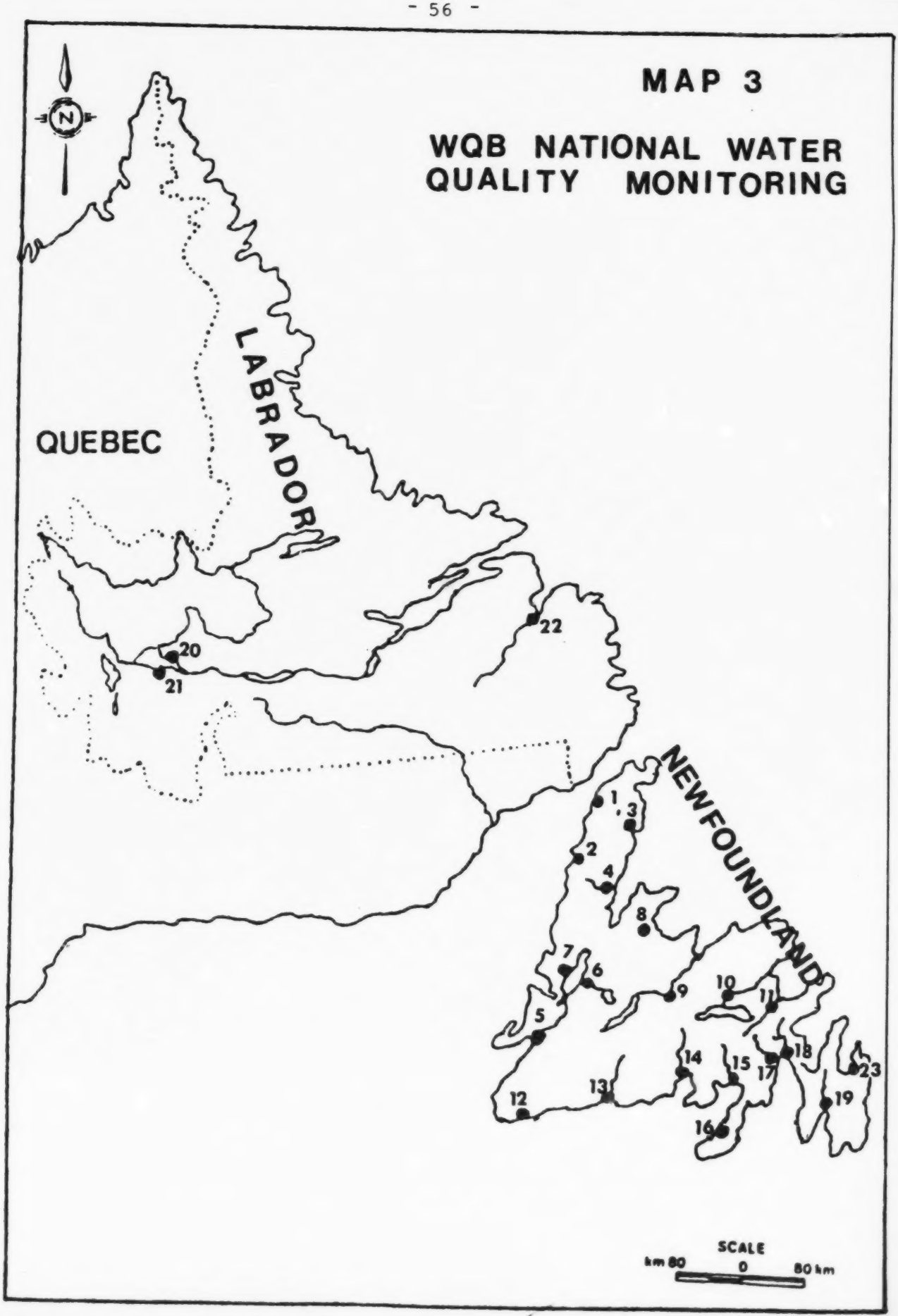
(14) "Survey of Toxic Constituents in the Atlantic Region's Aquatic Environment - 1982"; H.S. Bailey, IWD-AR-WQB-84-55, Water Quality Branch, Inland Waters Directorate, Atlantic Region, Moncton, N.B., Feb. (1984).

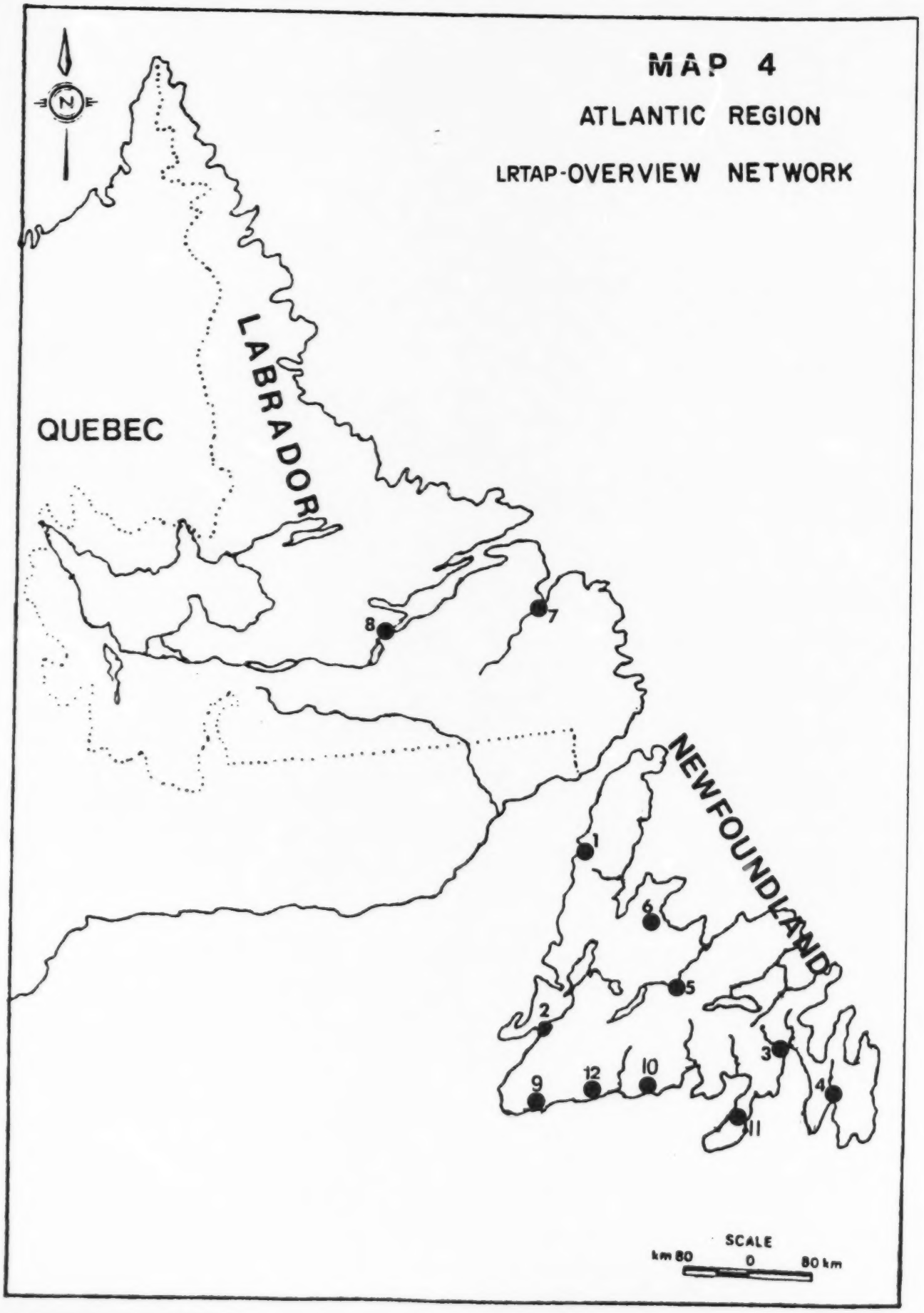
(15) "Field Quality Control/Quality Assurance Program. Results of 1984/85 Sequential Triplicate Sampling"; R. Arseneault and G. Howell, IWD-AR-WQB-85-78, Water Quality Branch, Inland Waters Directorate, Atlantic Region, Moncton, N.B., Mar. (1985).

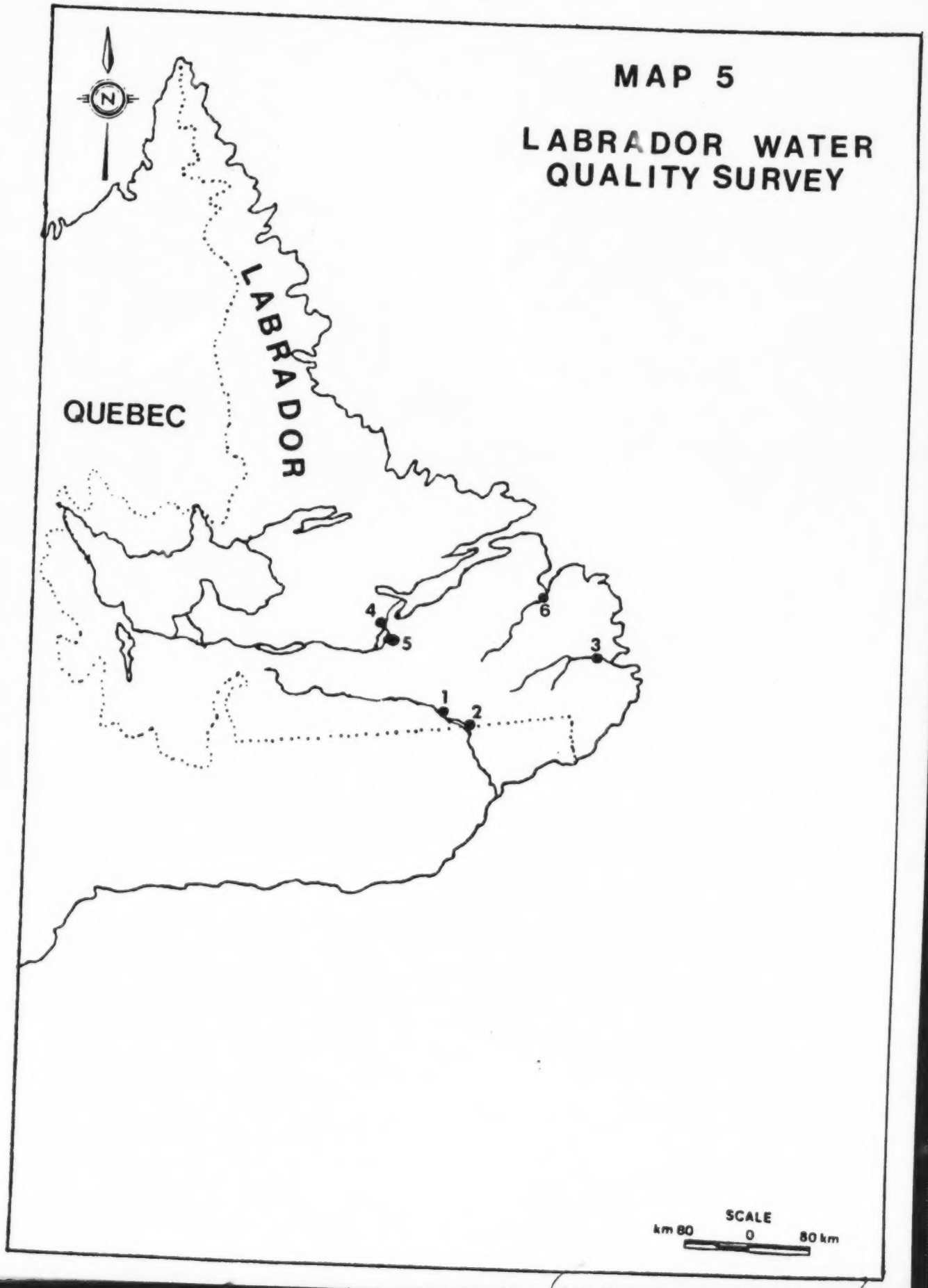
(16) "Surface Water Quality in the Waterford River Basin"; R.A. Arseneault, T.L. Pollock, S. Ratnam and D. Hansen, Environment Canada, Water Quality Branch, Atlantic Region, Moncton, N.B. (1985).

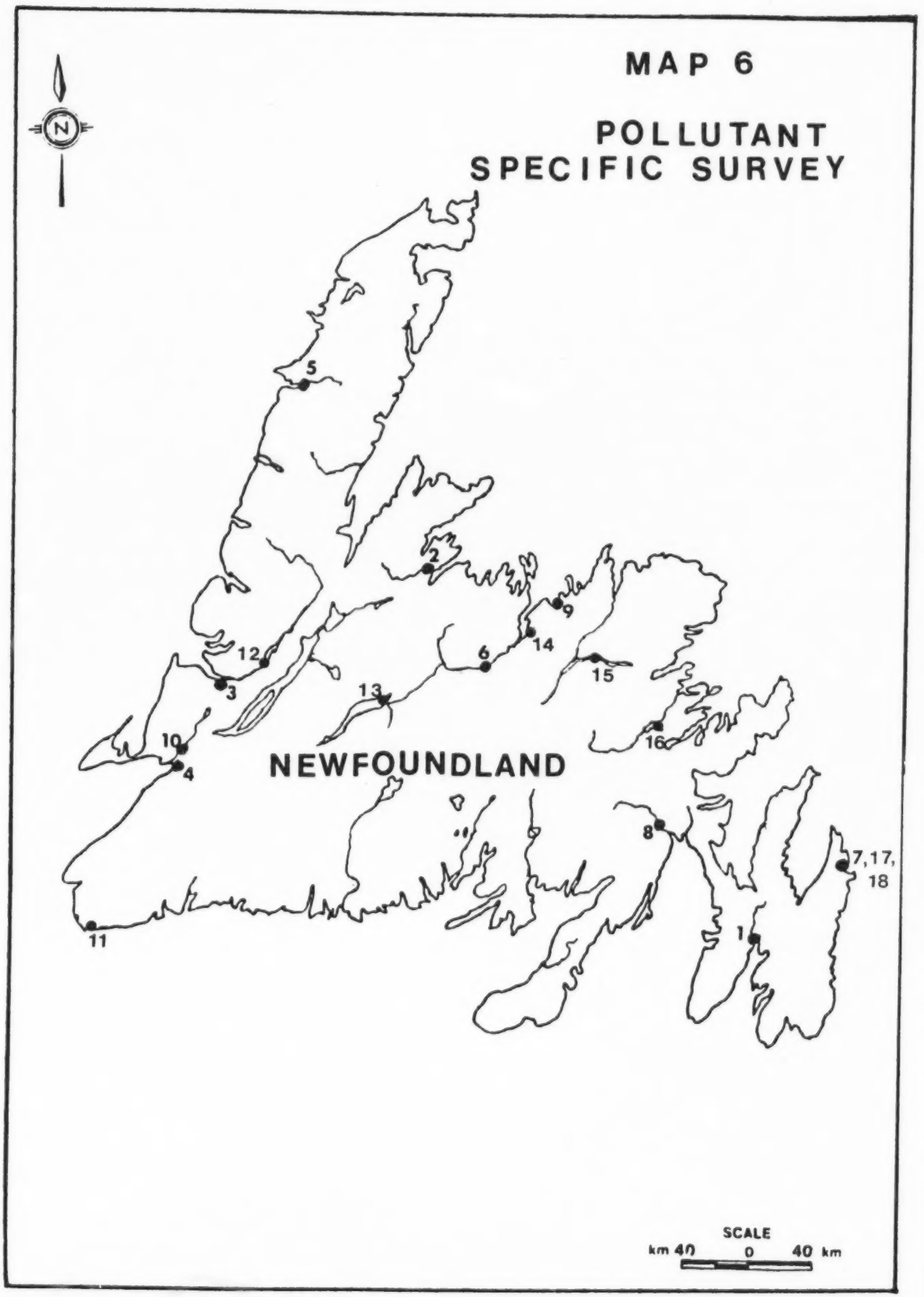

MAP 1
I. H.D. NATIONAL WATER QUALITY MONITORING
N
QUEBEC
LABRADOR
NEWFOUNDLAND
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
SCALE
km 80
0
80 km

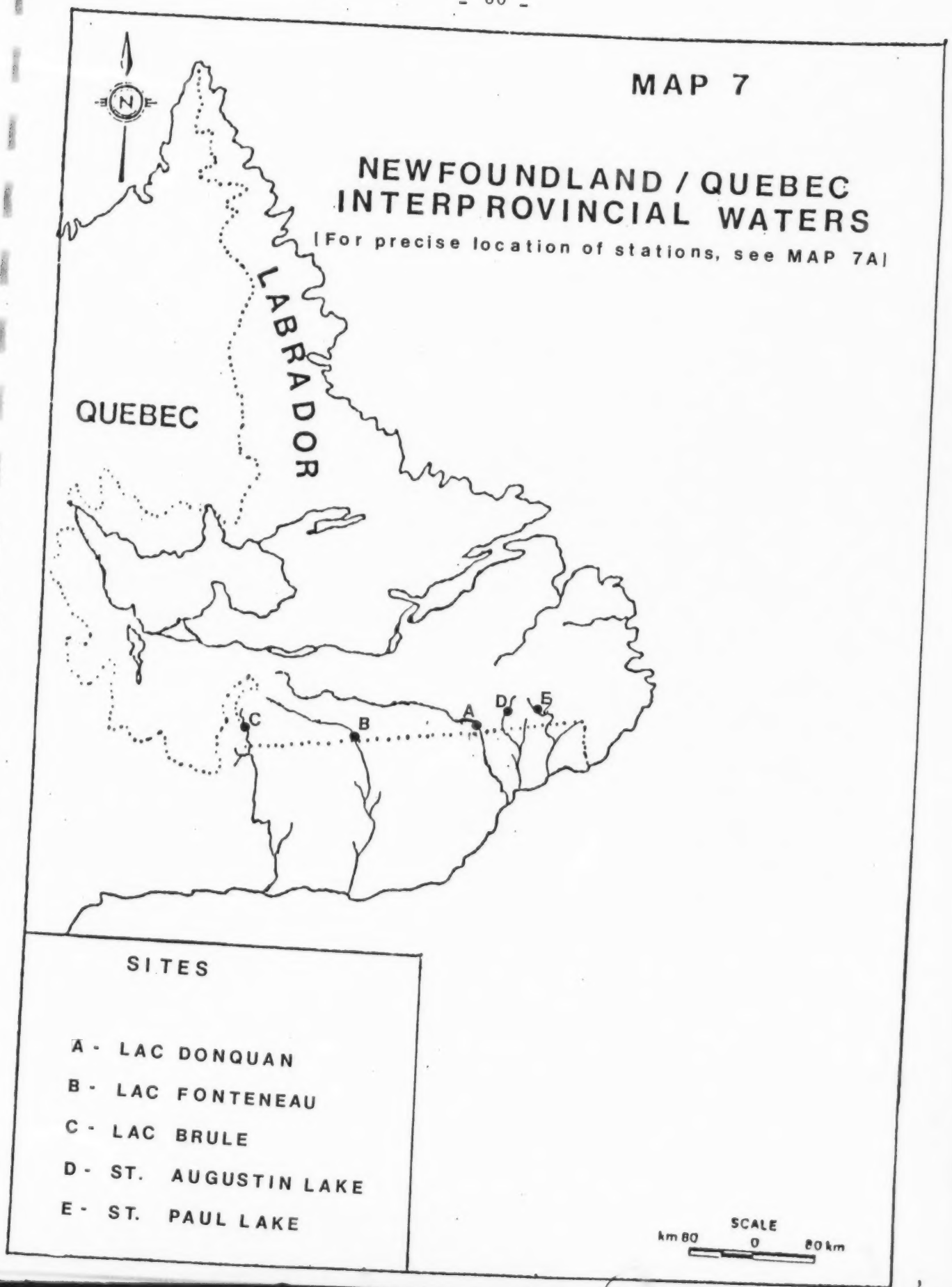

MAP 2
I.H.D. RESEARCH
BASIN STUDY
N
NEWFOUNDLAND
1
SCALE
km 40 0 40 km


MAP 3
WQB NATIONAL WATER QUALITY MONITORING
N
QUEBEC
LABRADOR
NEWFOUNDLAND
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
SCALE
km 80 0 80 km


MAP 4
ATLANTIC REGION
LRTAP-OVERVIEW NETWORK
N
QUEBEC
LABRADOR
NEWFOUNDLAND
1
2
3
4
5
6
7
8
9
10
11
12
SCALE
km 80
0
80 km

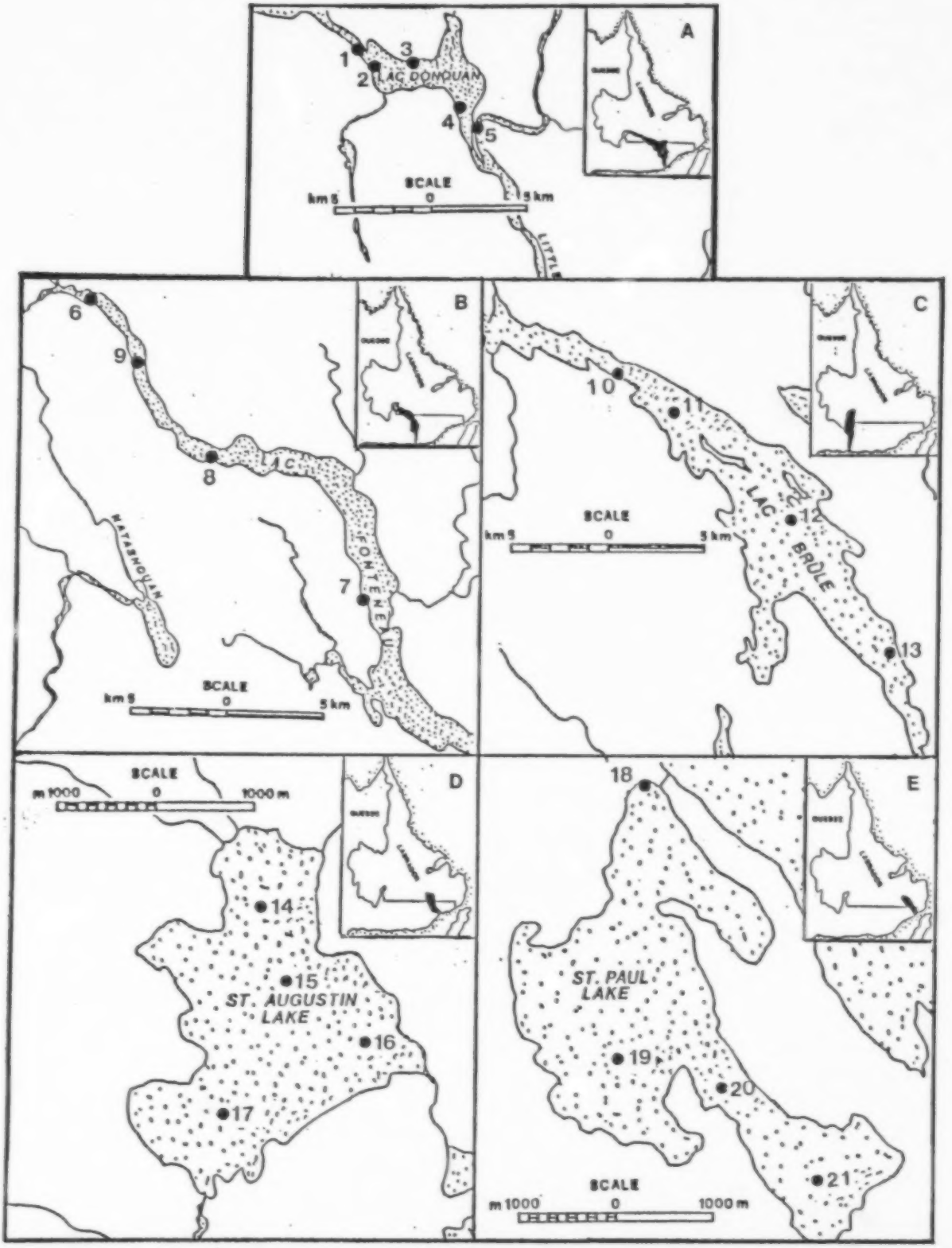

MAP 5
LABRADOR WATER QUALITY SURVEY
N
LABRADOR
QUEBEC
1
2
3
4
5
6
SCALE
km 80
0
80 km

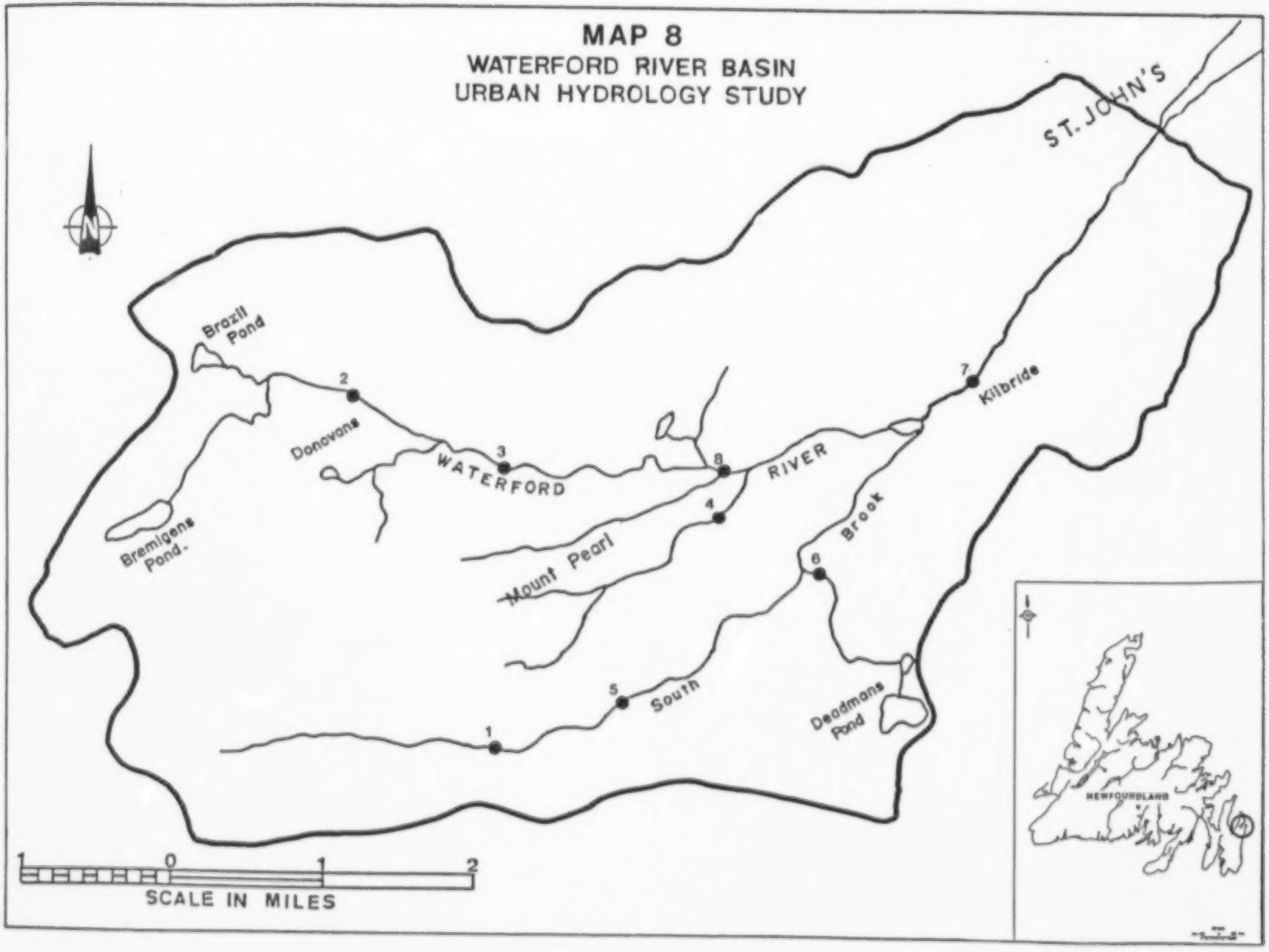

MAP 6
POLLUTANT
SPECIFIC SURVEY
N
NEWFOUNDLAND
1
2
3
4
5
6
7,17,
18
8
9
10
11
12
13
14
15
16
SCALE
km 40 0 40 km

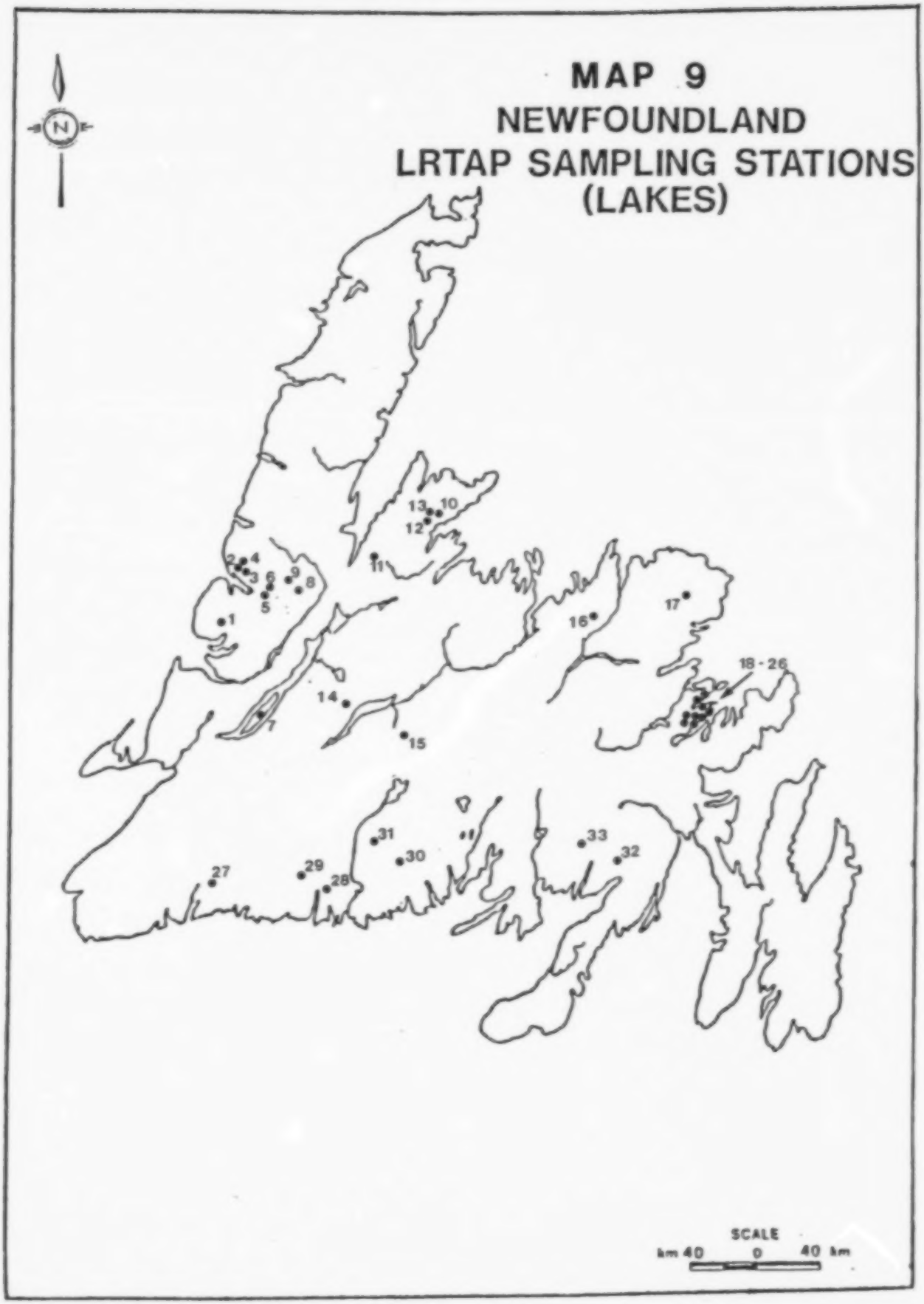

MAP 7
NEWFOUNDLAND / QUEBEC
INTERPROVINCIAL WATERS
(For precise location of stations, see MAP 7A)
N
LABRADOR
QUEBEC
A
B
C
D
E
SITES
A - LAC DONQUAN
B - LAC FONTENEAU
C - LAC BRULE
D - ST. AUGUSTIN LAKE
E - ST. PAUL LAKE
SCALE
km 80 0 80 km

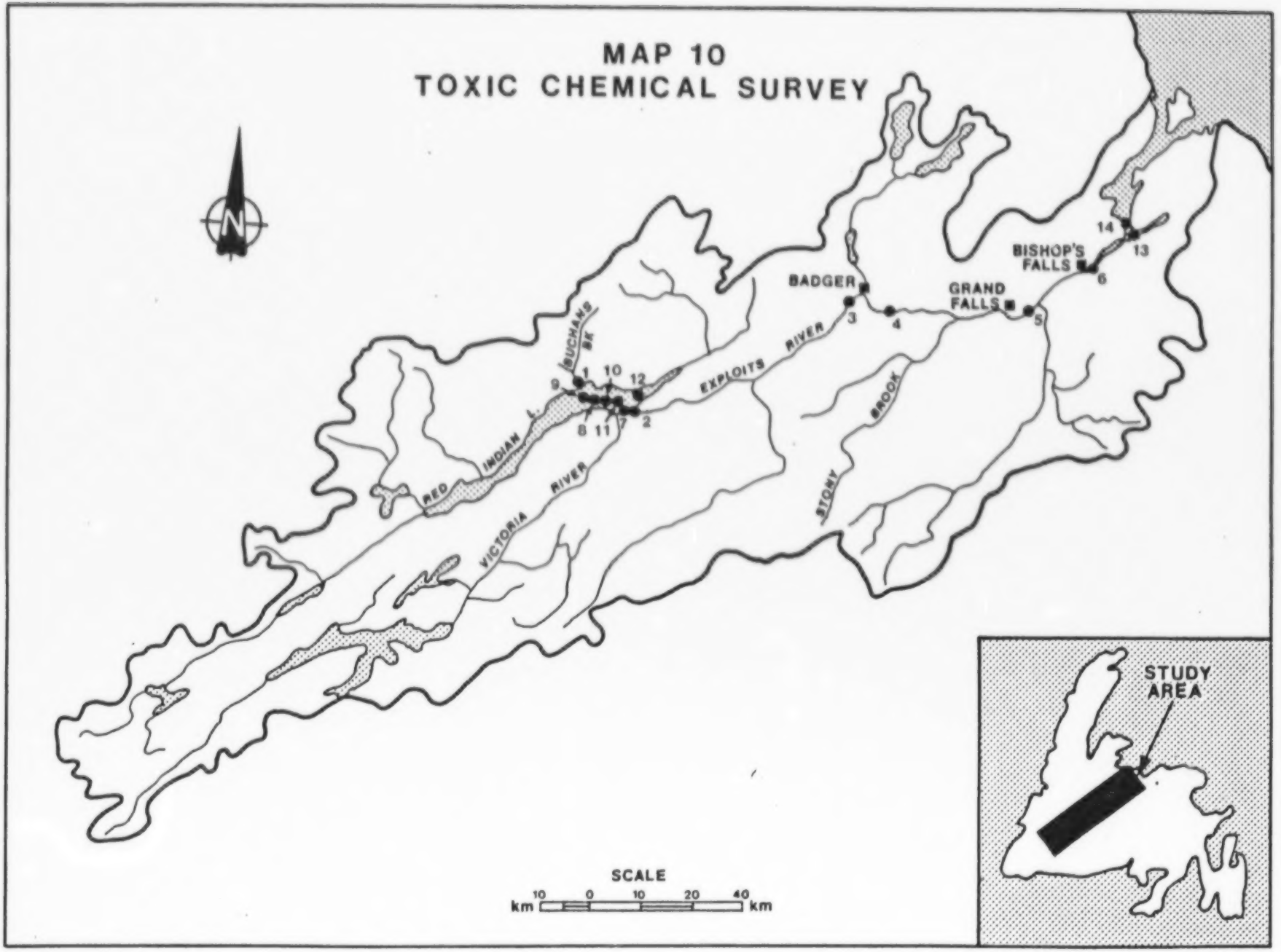
MAP 7A

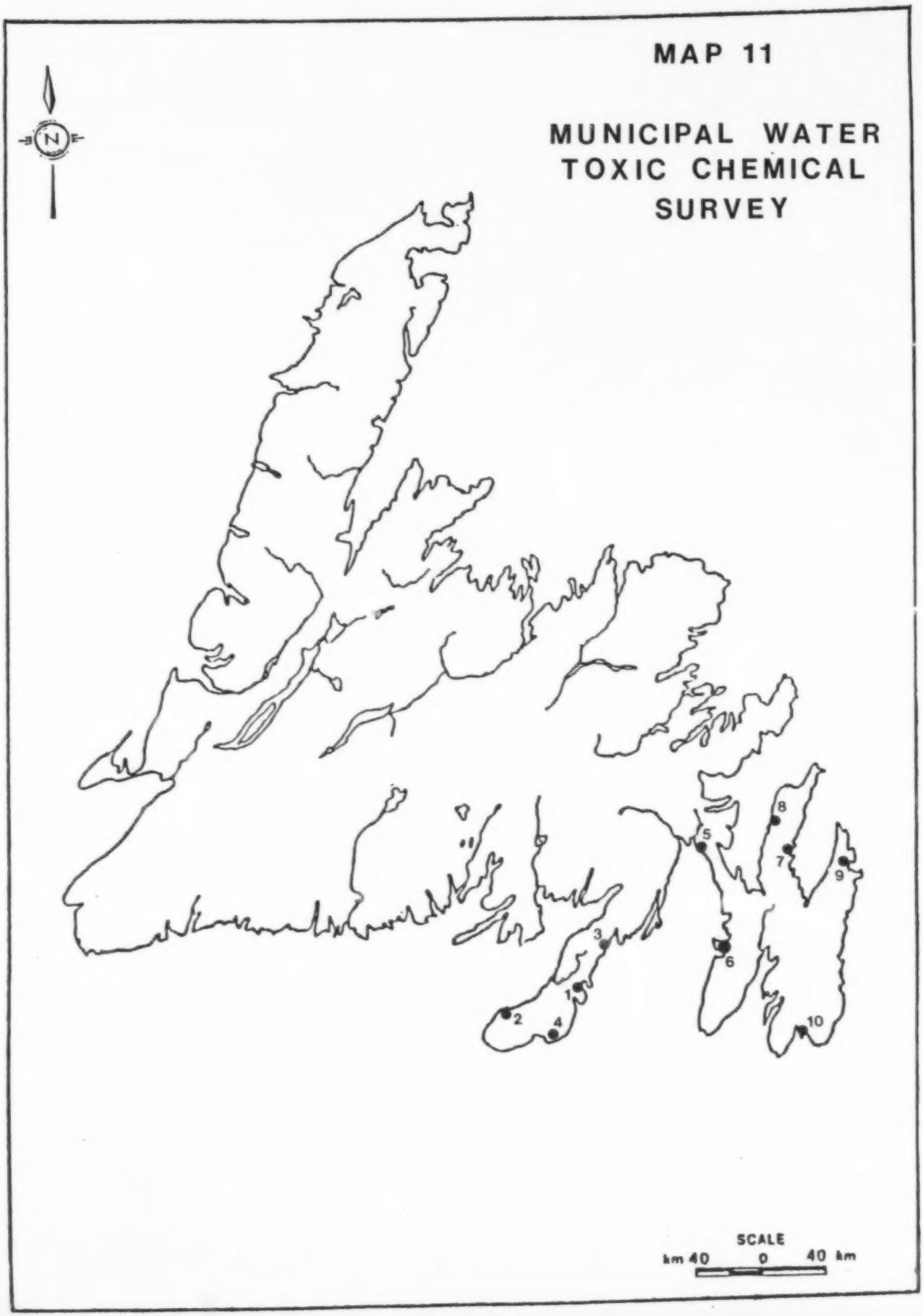
NEWFOUNDLAND / QUEBEC INTERPROVINCIAL WATERS STATIONS




MAP 8
WATERFORD RIVER BASIN
URBAN HYDROLOGY STUDY
ST. JOHN'S
Brazil Pond
Donovans
WATERFORD
RIVER
Bremigens Pond.
Mount Pearl
Brook
South
Deadmans Pond
Kilbride
1
2
3
4
5
6
7
8
1 0 1 2
SCALE IN MILES
NEWFOUNDLAND


MAP 9
NEWFOUNDLAND
LRTAP SAMPLING STATIONS
(LAKES)
N
1
2
3
4
5
6
8
9
10
11
12
13
14
15
16
17
18 - 26
27
28
29
30
31
32
33
SCALE
km 40 0 40 km


MAP 10
TOXIC CHEMICAL SURVEY
N
BUCHANS BK
RED INDIAN L.
VICTORIA RIVER
EXPLOITS RIVER
STONY BROOK
BADGER
GRAND FALLS
BISHOP'S FALLS
1
2
3
4
5
6
8
9
10
11
12
13
14
STUDY AREA
SCALE
10 0 10 20 40
km km


MAP 11
MUNICIPAL WATER
TOXIC CHEMICAL
SURVEY
N
1
2
3
4
5
6
7
8
9
10
SCALE
km 40 0 40 km